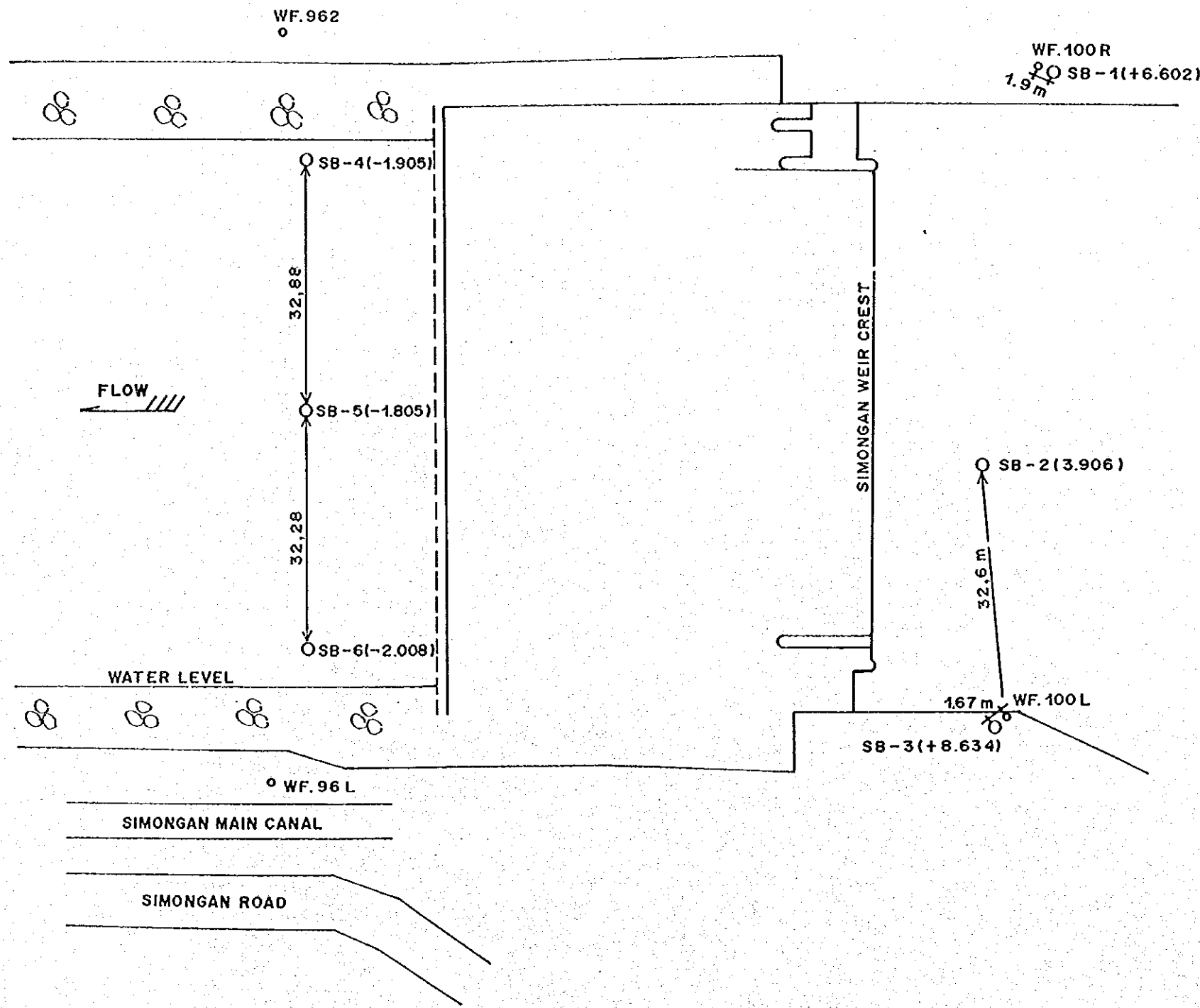
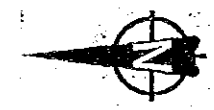


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.1 BORING LOCATION FOR WEST FLOODWAY AND GARANG RIVER



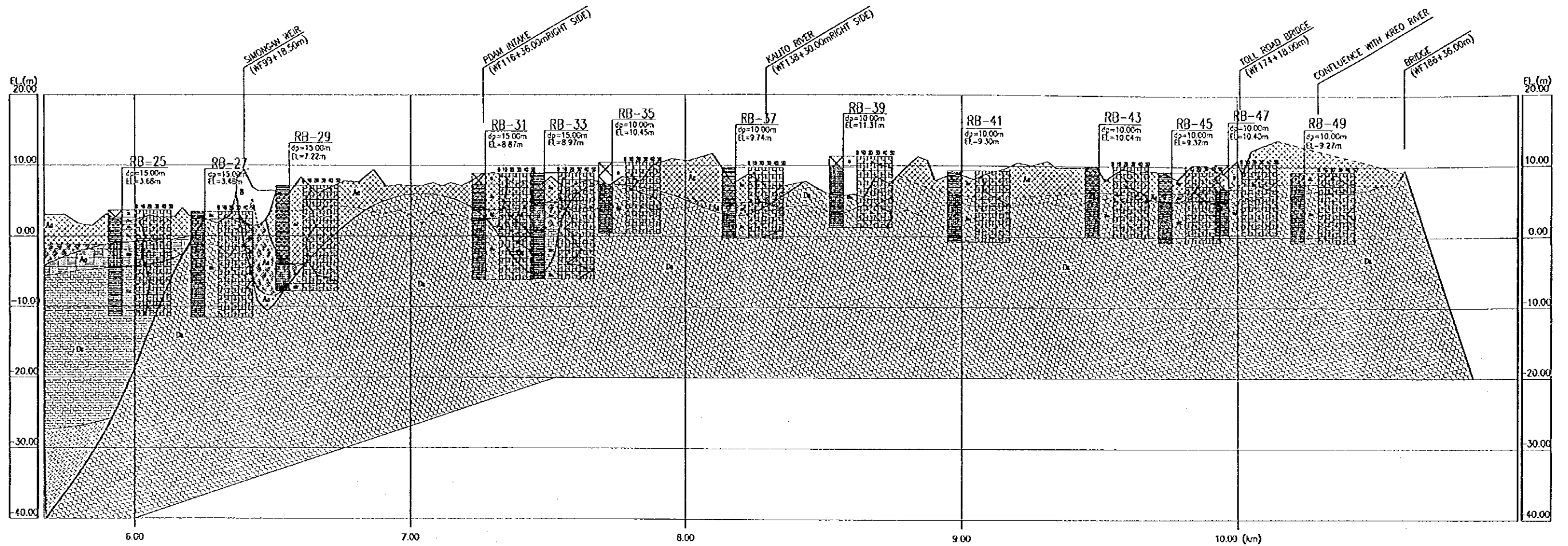
**LEGEND :**

○ SB - 2 ( 3.985 ) BORE HOLE

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Fig. 2.2 BORING LOCATION FOR WEST FLOODWAY AND GARANG RIVER



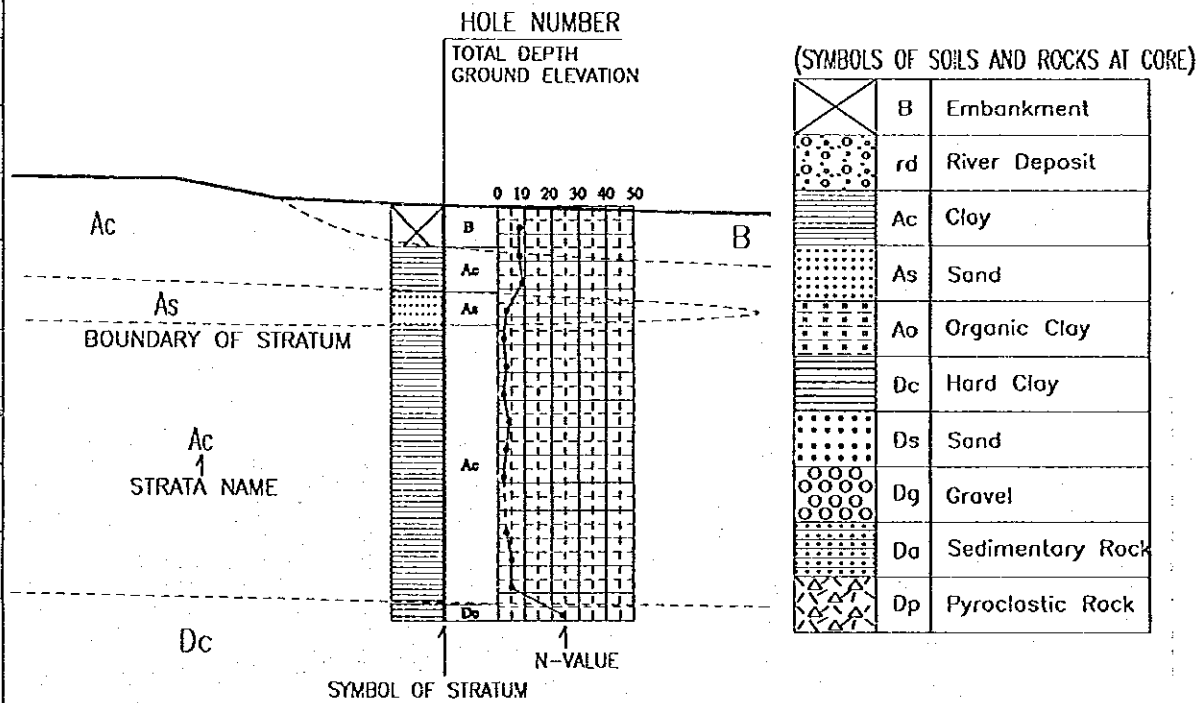


**LEGEND**

(Geological Strata)

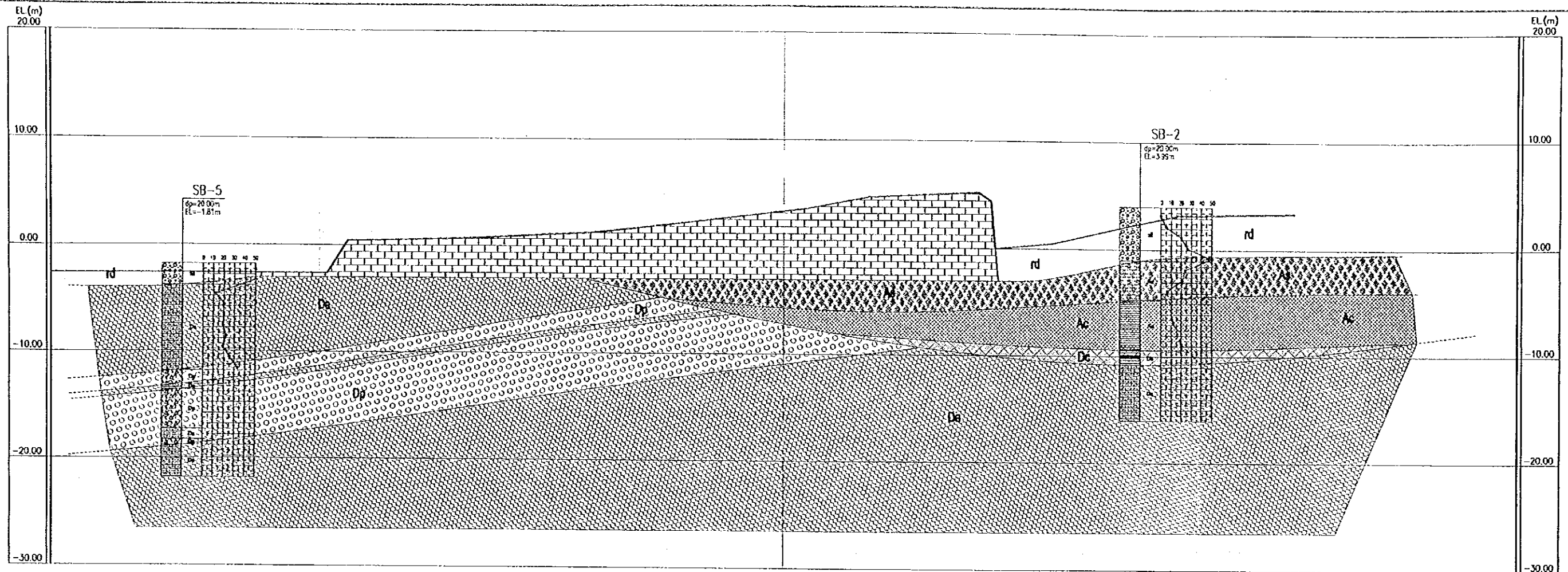
Age	Formation and Strata Name	Symbol	Description
Quaternary	Holocene	B	It consists of embankment, filled soil and refuse, and composed of clay, silt, sand and gravel.
		rd	It consists of sand and gravel mainly at the upstream area of Simongam Weir. But it consists of sand and clay mainly at the downstream area.
	Alluvium	Ac	It consists of clay and sandy clay, and shows gray. The sediments are very soft, and contain fragments of shell.
		As	It consists of fine grain sand and middle grain sand mainly, and contains the intercalated clay and silt generally. At the downstream area of Simongam Weir, it contains organic materials and fragments of shell.
Tertiary-Quaternary	Pleistocene	Ao	It consists of organic clay and organic fine grain sand mainly, but continuity as a stratum is poor.
		Dc	It consists of hard clay, and contains coral limestone partly. The surface part of this stratum is oxidized characteristically, and shows dark brown.
	Damer	Ds	It consists of sand mainly, and grain size of sand is from fine to coarse. And it contains many gravel, but diameter of gravel is smaller than 3cm generally.
		Dg	It consists of gravel and clay. The quality of clay is same as Dc stratum, and diameter of gravel is smaller than 20cm.
Pliocene-Pleistocene	Sedimentary Rock Unit	Ds	It consists of alternation of conglomerate, sandstone and siltstone mainly, and contains mafic tuff partly. Sandstone and siltstone have tuffaceous quality, and the change of grain size of sandstone is big. The matrix of conglomerate consists of same material of sandstone. The gravel of conglomerate consists of andesite and pumice, and diameter of gravel is smaller than 20cm.
	Pyroclastic Rock Unit	Dp	It consists of volcanic breccia and mafic tuff mainly, and alternation is forming. The volcanic breccia contains fragments of andesite and pumice, and matrix consists of mafic tuff.

(DESCRIPTION ON THE DRAWING)



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA  
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Fig. 2.3 (2/2)  
GEOLOGICAL PROFILE OF WEST GARANG RIVER LONGITUDINAL SECTION (LEFT BANK)

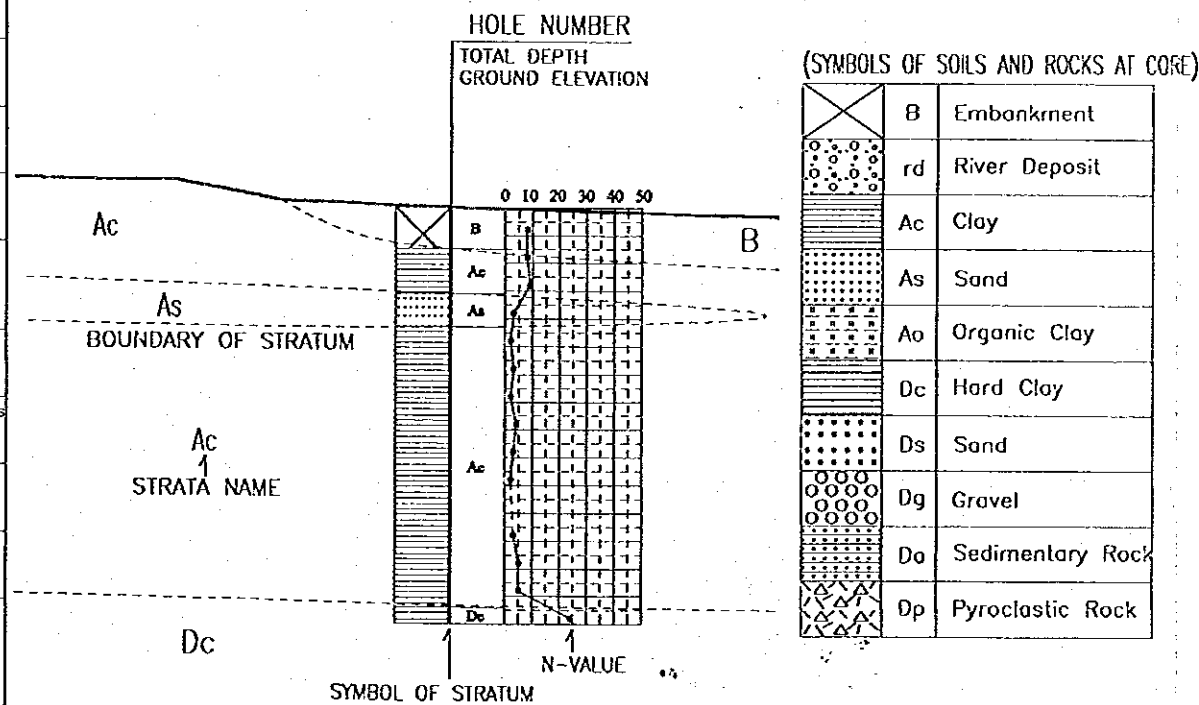


**LEGEND**

(Geological Strata)

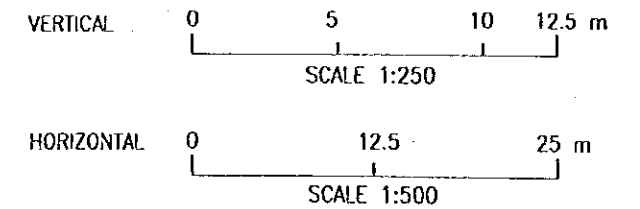
Age	Formation and Strata Name	Symbol	Description	
Quaternary	Holocene	B	It consists of embankment, fixed soil and refuse, and composed of clay, silt, sand and gravel.	
		rd	It consists of sand and gravel mainly at the upstream area of Simongan Weir. But it consists of sand and clay mainly at the downstream area.	
	Alluvium	Ac	It consists of clay and sandy clay, and shows gray. The sediments are very soft, and contain fragments of shell.	
		As	It consists of fine grain sand and middle grain sand mainly, and contains the intercalated clay and silt generally. At the downstream area of Simongan Weir, it contains organic materials and fragments of shell.	
		Ao	It consists of organic clay and organic fine grain sand mainly, but continuity as a stratum is poor.	
		Dc	It consists of hard clay, and contains coral limestone partly. The surface part of this stratum is oxidized characteristically, and shows dark brown.	
	Pleistocene	Ds	It consists of sand mainly, and grain size of sand is from fine to coarse. And it contains many gravel, but diameter of gravel is smaller than 2cm generally.	
		Dg	It consists of gravel and clay. The quality of clay is same as Dc stratum, and diameter of gravel is smaller than 20cm.	
	Tertiary-Quaternary Pliocene-Pleistocene	Damar	Da	It consists of alternation of conglomerate, sandstone and siltstone mainly, and contains mafic tuff partly. Sandstone and siltstone have buffaceous quality, and the change of grain size of sandstone is big. The matrix of conglomerate consists of same material of sandstone. The gravel of conglomerate consists of andesite and pumice, and diameter of gravel is smaller than 20cm.
			Dp	It consists of volcanic breccia and mafic tuff mainly, and alternation is forming. The volcanic breccia contains fragments of andesite and pumice, and matrix consists of mafic tuff.

(DESCRIPTION ON THE DRAWING)



(SYMBOLS OF SOILS AND ROCKS AT CORE)

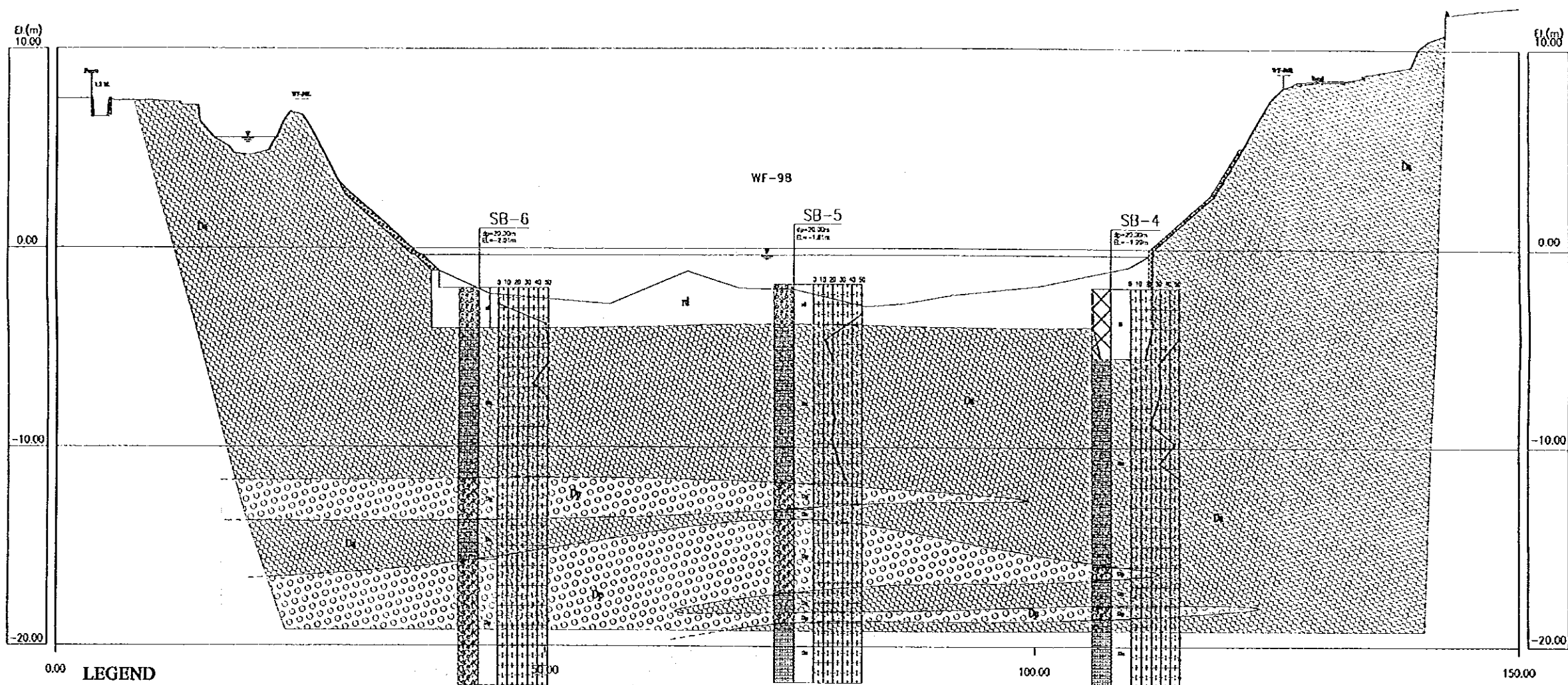
	B	Embankment
	rd	River Deposit
	Ac	Clay
	As	Sand
	Ao	Organic Clay
	Dc	Hard Clay
	Ds	Sand
	Dg	Gravel
	Da	Sedimentary Rock
	Dp	Pyroclastic Rock



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 2.4 GEOLOGICAL PROFILE OF SIMONGAN WEIR CROSS SECTION

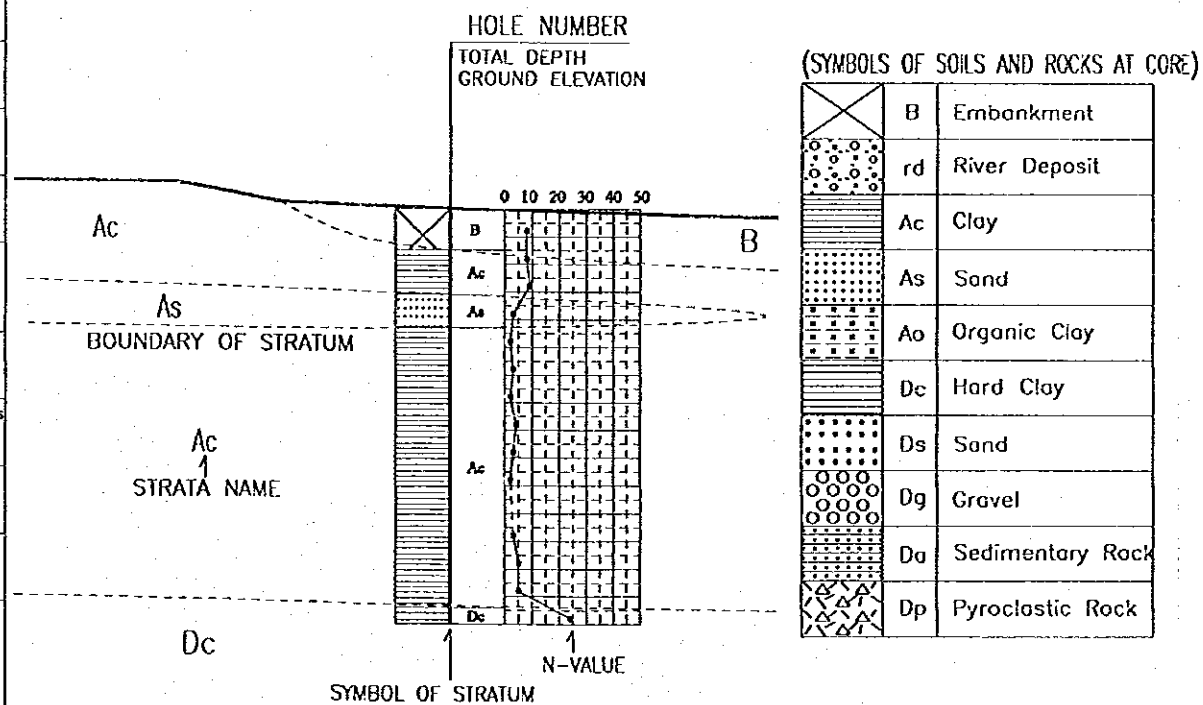


(Geological Strata)

LEGEND

Age	Formation and Strata Name	Symbol	Description	
Quaternary	Holocene	B	It consists of embankment, filled soil and refuse, and composed of clay, silt, sand and gravel.	
		rd	It consists of sand and gravel mainly at the upstream area of Simongan Weir. But it consists of sand and clay mainly at the downstream area.	
	Alluvium	Ac	It consists of clay and sandy clay, and shows gray. The sediments are very soft, and contain fragments of shell.	
		Ao	It consists of fine grain sand and middle grain sand mainly, and contains the intercalated clay and silt generally. At the downstream area of Simongan Weir, it contains organic materials and fragments of shell.	
Pleistocene	Diluvium	Dc	It consists of hard clay, and contains coral limestone partly. The surface part of this stratum is oxidized characteristically, and shows dark brown.	
		Ds	It consists of sand mainly, and grain size of sand is from fine to coarse. And it contains many gravel, but diameter of gravel is smaller than 3cm generally.	
		Dg	It consists of gravel and clay. The quality of clay is some as Dc stratum, and diameter of gravel is smaller than 20cm.	
Tertiary-Quaternary	Pliocene-Pleistocene	Damer	Ds	It consists of alternation of conglomerate, sandstone and siltstone mainly, and contains mafic tuff partly. Sandstone and siltstone have tuffaceous quality, and the change of grain size of sandstone is big. The matrix of conglomerate consists of some material of sandstone. The gravel of conglomerate consists of andesite and pumice, and diameter of gravel is smaller than 20cm.
			Dp	It consists of volcanic breccia and mafic tuff mainly, and alternation is forming. The volcanic breccia contains fragments of andesite and pumice, and matrix consists of mafic tuff.

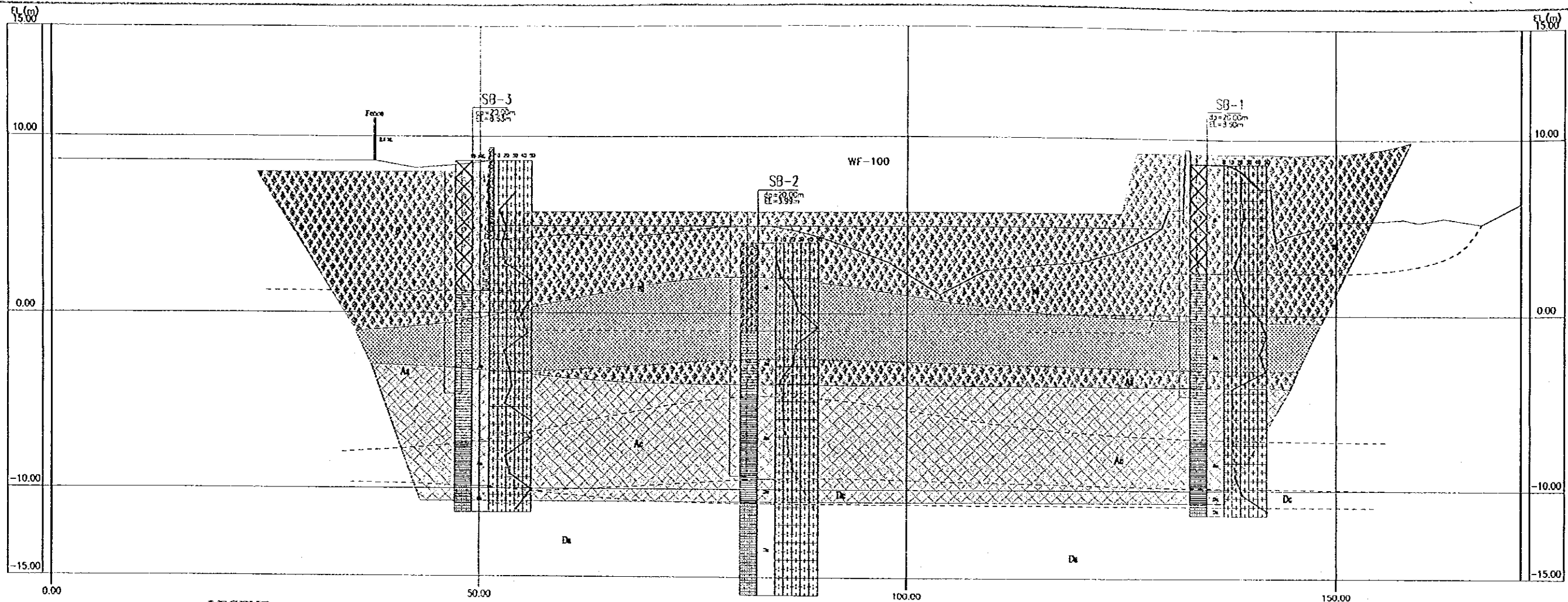
(DESCRIPTION ON THE DRAWING)



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 2.5 GEOLOGICAL PROFILE OF SIMONGAN WEIR WF.98 SECTION

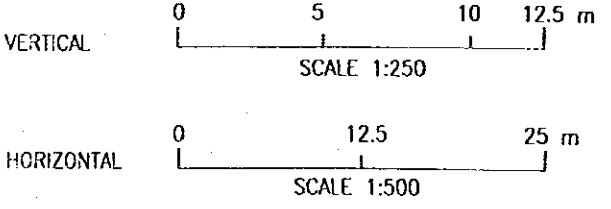
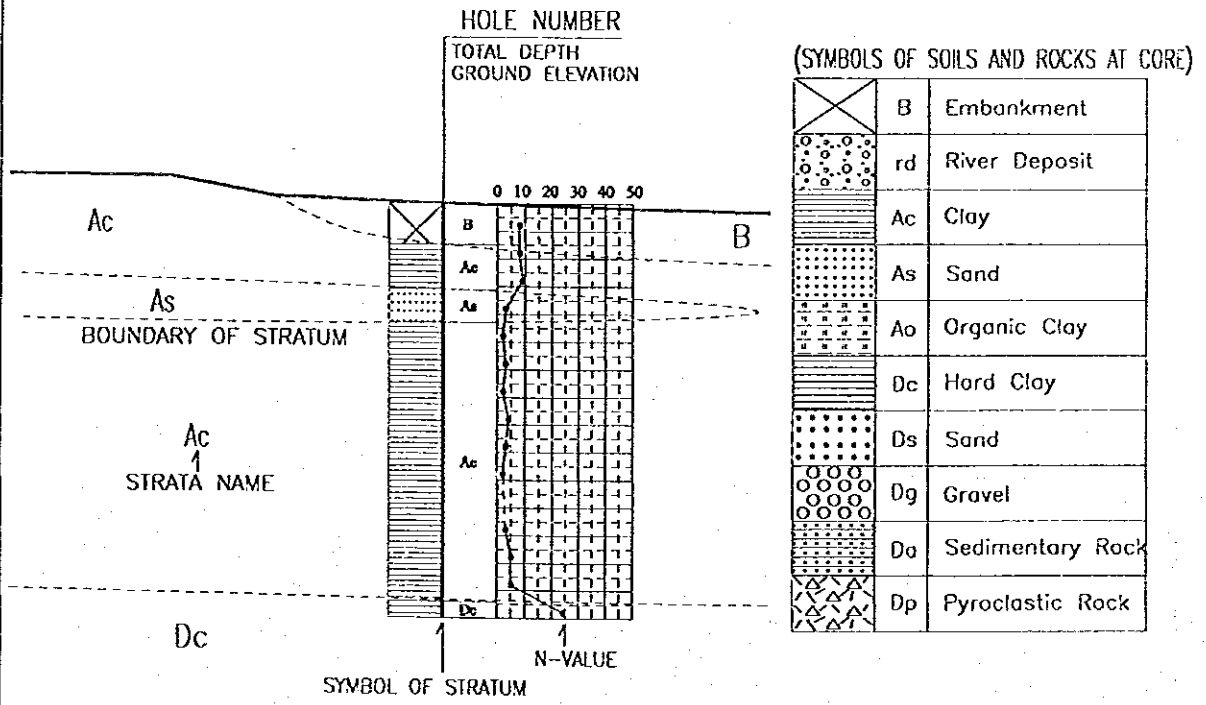


**LEGEND**

(Geological Strata)

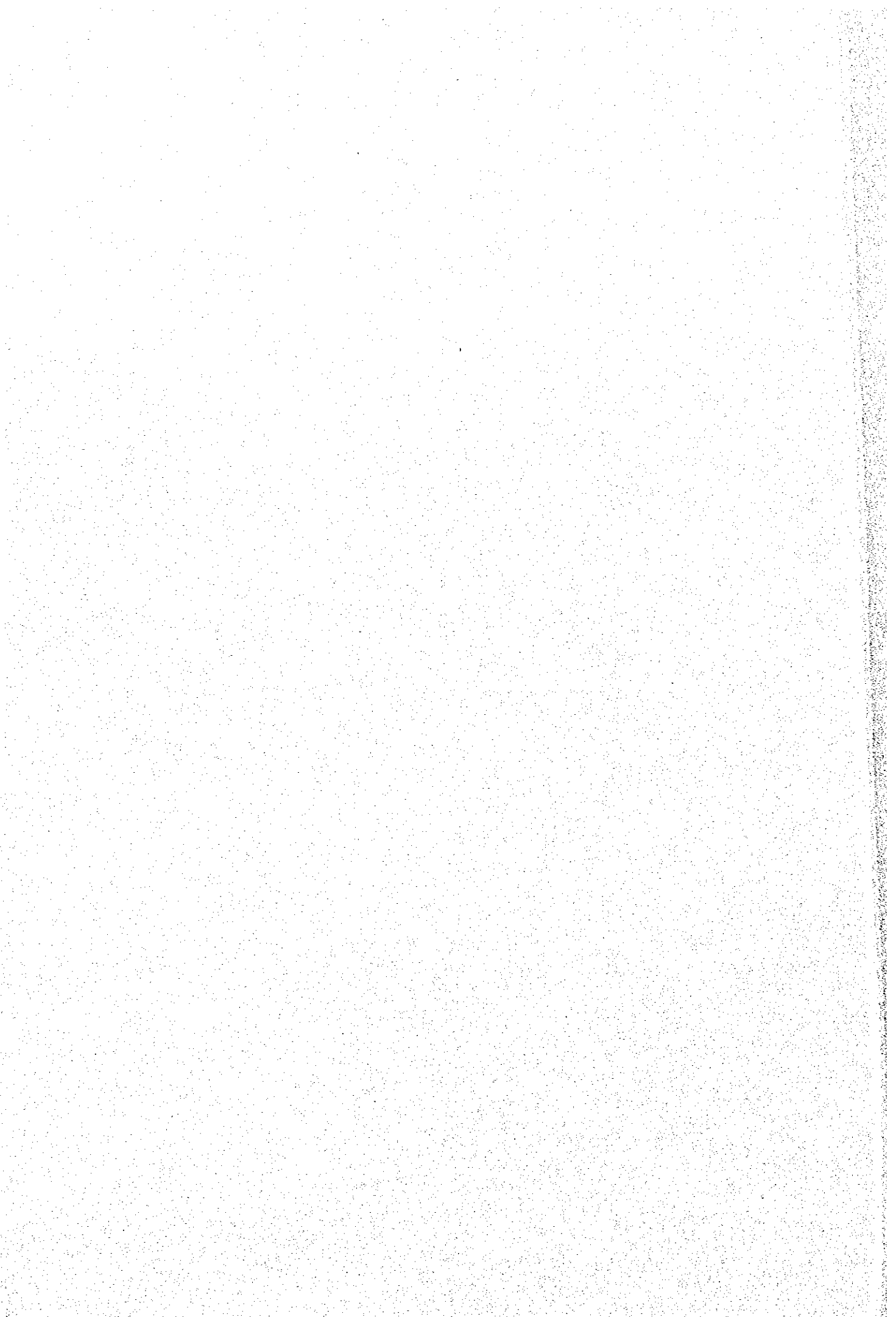
Age	Formation and Strata Name	Symbol	Description
Quaternary	Holocene	B	It consists of embankment, filled soil and refuse, and composed of clay, silt, sand and gravel.
		rd	It consists of sand and gravel mainly at the upstream area of Simongan Weir. But it consists of sand and clay mainly at the downstream area.
Quaternary	Alluvium	Ac	It consists of clay and sandy clay, and shows gray. The sediments are very soft, and contain fragments of shell.
		As	It consists of fine grain sand and middle grain sand mainly, and contains the intercalated clay and silt generally. At the downstream area of Simongan Weir, it contains organic materials and fragments of shell.
		Ao	It consists of organic clay and organic fine grain sand mainly, but continuity as a stratum is poor.
		Dc	It consists of hard clay, and contains coral limestone partly. The surface part of this stratum is oxidized characteristically, and shows dark brown.
Pleistocene	Diluvium	Ds	It consists of sand mainly, and grain size of sand is from fine to coarse. And it contains many gravel, but diameter of gravel is smaller than 3cm generally.
		Dg	It consists of gravel and clay. The quality of clay is same as Dc stratum, and diameter of gravel is smaller than 20cm.
		Da	It consists of alternation of conglomerate, sandstone and siltstone mainly, and contains mafic tuff partly. Sandstone and siltstone have tuffaceous quality, and the change of grain size of sandstone is big. The matrix of conglomerate consists of same material of sandstone. The gravel of conglomerate consists of andesite and pumice, and diameter of gravel is smaller than 20cm.
Tertiary-Quaternary	Pliocene-Pleistocene	Dp	It consists of volcanic breccia and mafic tuff mainly, and alternation is forming. The volcanic breccia contains fragments of andesite and pumice, and matrix consists of mafic tuff.

(DESCRIPTION ON THE DRAWING)

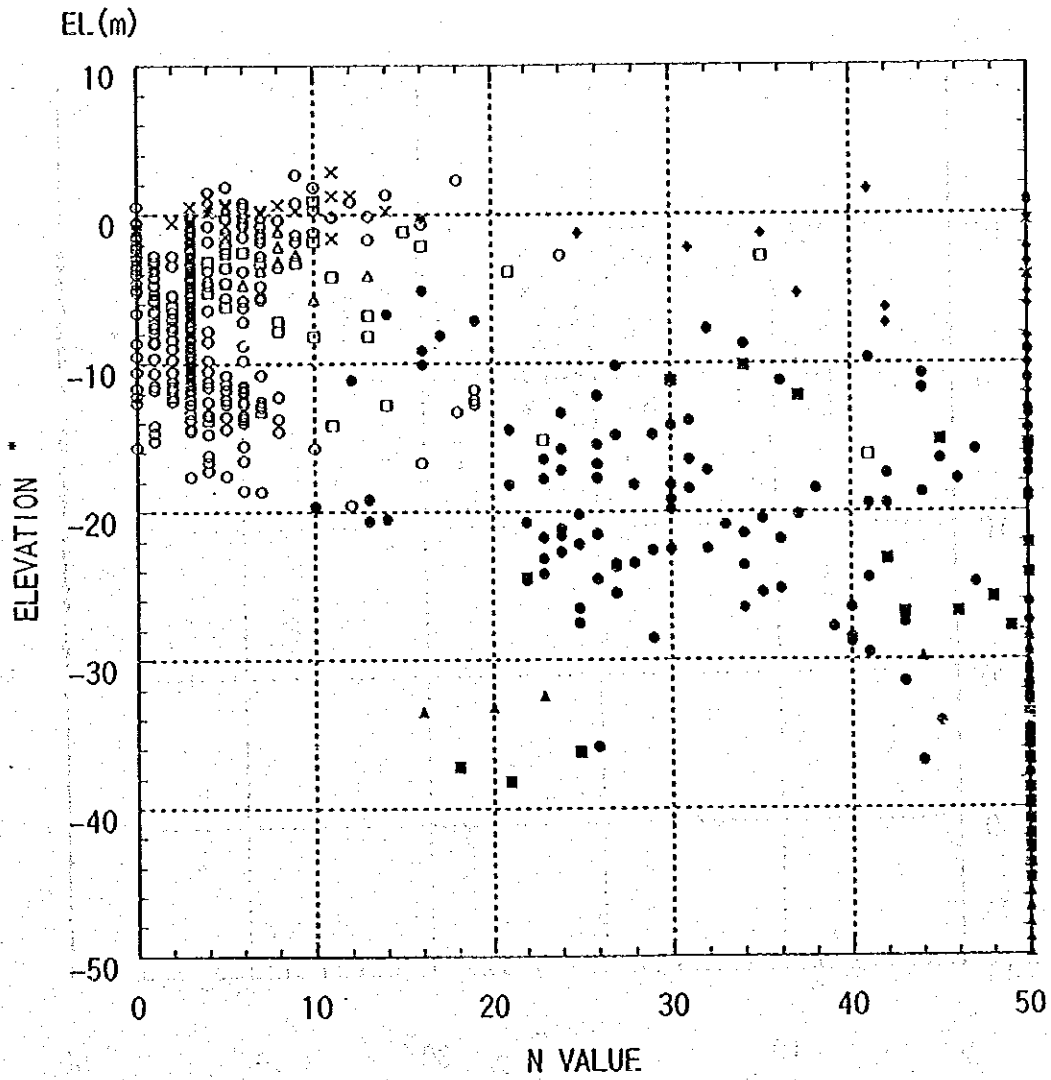


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Fig. 2.6  
GEOLOGICAL PROFILE OF SIMONGAN WEIR  
WF-100 SECTION







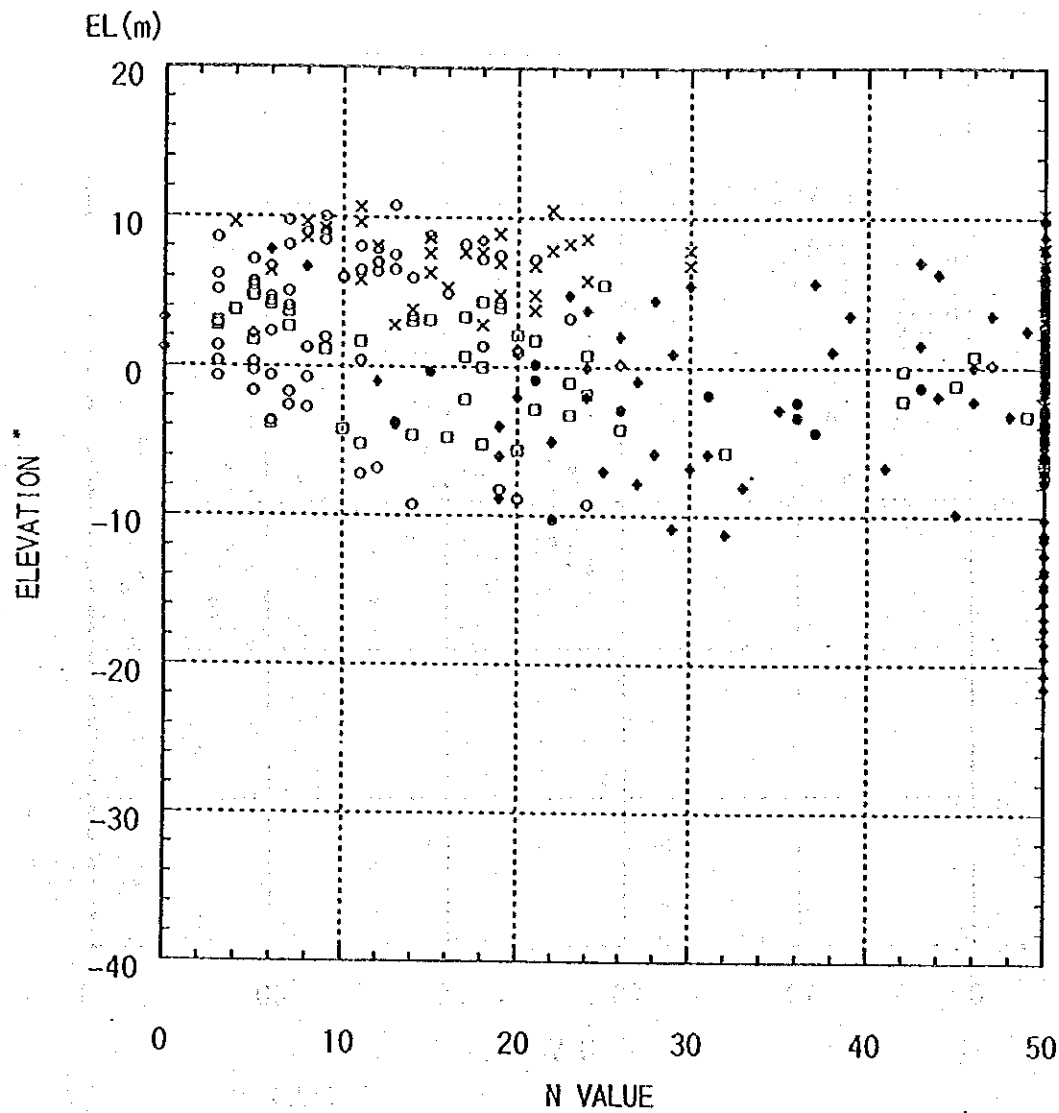
LEGEND

- × Embankment
- Clay (Alluvium)
- Sand (Alluvium)
- △ Organic clay (Alluvium)
- Clay (Diluvium)
- Sand (Diluvium)
- ▲ Gravel (Diluvium)
- ◆ Bed rock

\* Elevation shows the middle point of Standard Penetration Test Section

Fig. 2.7

RELATIONSHIP BETWEEN N VALUE AND DEPTH OF S.P.T SECTION (WEST FLOODWAY)



**LEGEND**

x	Embankment
◇	Riverbed deposit
○	Clay (Alluvium)
□	Sand (Alluvium)
●	Clay (Diluvium)
◆	Bed rock

\* Elevation shows the middle point of Standard Penetration Test Section

Fig. 2.8  
RELATIONSHIP BETWEEN N VALUE AND DEPTH OF S.P.T SECTION (GARANG RIVER/SIMONGAN WEIR)

**CHAPTER 3 PHOTOGRAMMETRIC MAPPING AND  
TOPOGRAPHICAL SURVEY**

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## Photogrammetric Mapping

### (1) Aerial Photography

Aerial photography at a scale of 1:8,000 and covering approximately 64 line kilometer in total was started after obtaining permission from the Central Survey and Mapping ABRI (PUSSURTA ABRI).

The results of the aerial photography are as follows:

Total No. of Films	1 Roll
Total Flight Runs	12 Runs
Total Exposures	156 Photos
Overlap and Side Lap	55% and 35%

### (2) Stereo Plotting

The implication and purpose of stereo plotting and editing work are drawing details and contour lines used existing aerial photo diapositives, which are placed on the plate holders of the stereo plotter instrument (refer to Fig.3.1).

The sequences of the plotting and editing works are as follows:

#### (a) Data collection

All necessary data were collected and prepared for stereo plotting such as:

- Model index of aerial triangulation;
- Print out of aerial triangulation adjustment;
- Vertical control points and description on two (2) times enlarged aerial photographs; and
- Field identification on two (2) times enlarged aerial photographs.

#### (b) Planning

Preparation of stereo plotting was carried out as follows:

##### (i) Control sheets

Total control sheets of the stereo plotting topographic map are:

- 1 sheet for 1:2,000 scale of Railway topographic map

(ii) Models

Total models of stereo plotting are:

- 4 models for 1:2,000 scale of Railway topographic map

(c) Preparation of Control Sheets

Control sheets were produced by block adjustment result of aerial triangulation on polyester base material.

(d) Plotting

Plotting manuscript at the scale of 1:2,000 were produced from existing aerial photos at the scale of 1:8,000 by using second order precision plotter.

The sequences of the stereo plotting works are as follows:

- Inner Orientation;
- Relative Orientation;
- Absolute Orientation; and
- Plotting of details, spot height, vegetation boundary and contour lines.

Contour intervals for intermediate contour line are 1m map with the scale of 1:2,000.

Editing works was carried out on the plotting manuscript by compiling result of field identification, such as symbol annotation etc.

(e) Result

The final manuscript was used for the fair drawing work and the numbers of sheets plotting manuscript are as below.

- 1 sheet plotting manuscript at scale of 1:2,000 for Railway area

(2) Fair Drawing

The implication and purpose of fair drawing work are drawing details using symbols and contour lines with tracing method from the plotting manuscript and other

additional data and information.

The sequence of the fair drawing were carried out as follows:

**(a) Data Collection**

All necessary data were collected and prepared for fair drawing such as:

- Plotting manuscript;
- Vertical control points and description on two (2) times enlarged aerial photographs; and
- Field identification results on two (2) times enlarged aerial photographs.

**(b) Planning**

Preparation for fair drawing were carried out as follows:

**(i) Drawing sheets**

Total sheets of fair drawing are 4 sheets, consisting of 2 sheets of Semarang map and 2 sheets of Ungaran map at scale of 1:2,000.

**(ii) Legend and Symbol**

The symbols and legend used in map are summarized in Table 3.1

**(c) Preparation**

The preparations were carried out as follows:

**(i) Drawing sheets**

Drawing sheets were made using computer PC on polyester base.

The sheet's size is A1 (60 cm x 85 cm).

**(d) Fair drawing**

Fair drawing was carried out with tracing method using drafting pen and black ink from plotting manuscript at scale of 1:2,000.

Fair drawing works are as follows:

- Drawing details;
- Spot heights and contour lines;
- Symbols and annotations, on the map symbols must be matched to legend; and
- Vegetation boundary.

Contour interval for intermediate contour lines are 1 m for map at scale of 1:2,000.

(e) Results

The final results of the fair drawing are:

- 1 sheet topographic map at scale of 1:2,000 for the Access Road to Railway Bridge.
- 1 sheet duplicate at scale of 1:2,000 for the Access Road to Railway Bridge.

### 3.2 Ground Survey

#### (1) Longitudinal Profile and Cross-Section Survey

##### (a) Installation of Kilometer Post

Prior to the commencement of the river longitudinal profile survey, kilometer posts of wooden pegs were installed on the right and left banks of West Floodway, Garang, Semarang, Asin and Baru rivers. When the location of a kilometer post is very close to such structures as bridges, water intake and water pipes, kilometer posts were shifted to the center line of these structures. The position of a kilometer post was decided by traverse method in the field.

##### (b) Longitudinal Profile Survey

The river longitudinal profile survey (the profile survey) by direct leveling was executed to obtain heights of kilometer posts for the river cross section survey and to prepare longitudinal profile sections. Leveling routes were formed by closed loops and double-runs. A total distance of the leveling survey covering West Floodway, Garang, Semarang, Asin and Baru rivers was 41 km.



The datum height was applied for the longitudinal profile survey including river cross section survey and auxiliary leveling. The heights of TTGs bench marks are applied to the kilometer posts by direct leveling.

All results of heights of kilometer posts by the profile survey, the deepest height of the river cross section survey, names of bridge and others were edited by Auto CAD system.. The longitudinal profile sections at a horizontal scale of 1:2,000, 1:1,000 and vertical scale of 1:100 were prepared on the draft plotting paper sheets using the longitudinal profile data.

(c) River Cross Section Survey

Heights and distance of slope changing points, roads, channels, etc. along the cross section lines were measured by using a Total Station System, levels and Electric Distance Meter (EDM).

Water levels and depths of the rivers were measured using a survey rod, and the distance of these measured simultaneously. The bridges, irrigation intakes and water pipes of all rivers were also measured. A total number of cross sections surveyed are approximately 814.

(d) Checking of Longitudinal Profile

(i) The check results of differences in height closure between the kilometer posts did not exceed  $20\sqrt{S}$  (S: length of single run in kilometer) as specified in the Technical Specifications.

(ii) Checking of River Cross Sections

At the same kilometer posts checked above, river cross section lines were measured. The check results of height of these cross section line points did not exceed  $\pm 50$  mm and distance errors between the cross section line points are less than 1/300 as specified in the Technical Specifications.

Longitudinal profile and cross-section were surveyed along West Floodway, Garang, and two (2) tributary channels along Garang River.

### West Floodway and Garang River

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	9.598 km	5	H=1/2,000 V=1/100	Sheet Size: A1
Cross-Section Survey	204 sections	104	H=1/200 V=1/100	Sheet Size: A1

### Cengkek River (tributary of Garang River)

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	0.499 km	1	H=1/1,000 V=1/100	Sheet Size: A1
Cross-Section Survey	15 sections	8	H=1/200 V=1/100	Sheet Size: A1

### Kalito River (tributary of Garang River)

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	0.498 km	1	H=1/1,000 V=1/100	Sheet Size: A1
Cross-Section Survey	12 sections	6	H=1/200 V=1/100	Sheet Size: A1

### Railway

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	4 km	1	H=1/2,000 V=1/100	Sheet Size: A1
Cross-Section Survey	Approx. 41 sections	approx. 14	H=1/100 V=1/100	Sheet Size: A1

### Simongan Weir Site

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	-	-	H=1/1,000 V=1/100	Sheet Size: A1
Cross-Section Survey	Approx. 13 sections	approx. 7	H=1/100 V=1/100	Sheet Size: A1

### Tributary of Garang River

Work Item	Volume	Drawing		Remarks
		No. of Sheets	Scale	
Longitudinal Profile	0.08 km	1	H=1/100 V=1/100	Sheet Size: A1
Cross-Section Survey	Approx. 5 sections	Approx. 3	H=1/100 V=1/100	Sheet Size: A1

#### (2) Topographic Survey

Topographic surveys were carried out for Simongan Weir site and Midstream of Garang River (refer to Fig. 3.1). The work of quantities carried out are as follows.

Site	Quantity	Scale
Simongan Weir Site	4,675 m <sup>2</sup>	1 : 100
Midstream of Garang Rive	4,000 m <sup>2</sup>	1 : 100

### 3.3 Structural Survey

#### (1) Location

Structural survey were conducted at Railway Bridge and Simongan Weir to investigate size, shape, configuration, material and so on.

#### (4) Drawing

Drawings have been plotted at scale 1: 50 and 1:100.

The final results of the fair drawing are as follow:

Work site	Drawing No. of Sheets	Remarks
Railway Bridge	5	Sheet Size: A1
Simongan Weir	7	Sheet Size: A1

### 3.4 Land Subsidence

In the Past decade, land subsidence was caused in the coastal area of Semarang City due to the excess exploitation of ground water by the industrial sector. During this study period, leveling survey of TTGs and benchmarks that were established by the JICA Study Team in August 1997.

As a result of the survey, all of the benchmarks established by the Team are found to be subsided with the range of 1.2 cm and 10.0 cm.

The leveling survey was carried out with the following procedure.

(1) Datum Elevation

The elevation of TTG obtained from the Mean Sea Level of Indonesia established by Bakosurtanal are applied as the datum elevation.

(2) Checking of Government Bench Marks

Before starting leveling survey, elevation of three government benchmarks namely TTG446, TTG447 and TTG449 were checked and the results are presented in the table below.

Leveling Loops	Distance	Misclosure
TTG449 to TTG447	4.5 km	8 mm
TTG447 to TTG446	5.7 km	-210 mm

From the above, it was judged by the JICA Study Team that TTG446 shall be ignored because TTG446 is considered to be subsided by about 21 cm from 1983.

The JICA Study Team decided to use TTG447 as the benchmark for Subsidence leveling.

(3) Accuracy of Leveling

As show in Fig. 3.2 and 3.3, any misclosure of leveling does not exceed  $10\text{mm}/\sqrt{S}$  between benchmarks (S: a single distance between bench marks in kilometer). And Standard division was  $1.18\text{ mm}/\text{km}$  and  $2.82\text{mm}/\text{km}$ .

For examination, 10 permanent benchmarks were checked. Re-examining these points at regular intervals can more easily check the amount of annual rate of land subsidence. The survey result are as shown in Fig.3.4

Table 3.1 (1/3) MAP SYMBOLS
















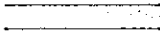

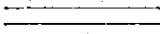

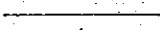

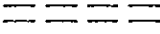

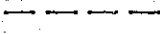

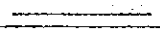



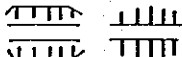

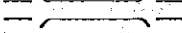


	Triangulation point		Market
	GPS point		Transformer house
	Bench Mark TTG		Bank
	Minor order levelling		Gas station
	Spot elevation		Telephon office
	Minor order BM		Government office
	House/Building		Hotel
	Factory		Main road
	Public hall		Road > 2m
	Public station		Road 1-2m
	Mosque		Road under construction
	Church		Footpath
	Temple		Median strips
	Hospital		Road and strips
	Fire station		Cutting and Embankment
	Post office		Iron and concrete bridge
	School		Wooden bridge

Table 3.1 (2/3) MAP SYMBOLS

	Foot bridge bamboo bridge		Cultivation land boundary
	Culvert		Rice field
	Rail way		Farm/Cultivated
	Railway bridge		Sugar cane
	Station		Palm plantation
	Intersecting railway		Rubber plantation
	Water/Oil pipe		Teak plantation
	Water/Oil tank		Coffee plantation
	Automatic waterlevel gauge		Cacao plantation
	Electricity power		Orchard
	Wall hedge/Fence		Other plantation
	Monument		Bush
	Moslem graves		Grass field
	Christian cemetery		Trees/Forest
	Chinese graves		Dead trees
	Buddha graves		Bore land
	Vegetation boundary		Bamboo copse

Table 3.1 (3/3) MAP SYMBOLS



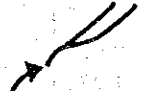

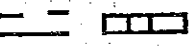
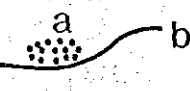
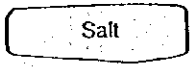

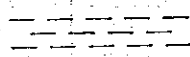



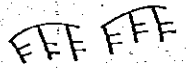
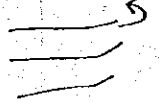

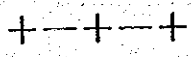
	River(a), rivulet(b) direction(c)	+..+..+..+	Kecamatan boundary
	Channel		
	Water fall		
	Small/large weir		
	Small/large watergate		
	Sand(a), shore line(b)		
	Salt		
	Fish pond/Pond, Lake		
	Swamp		
	Depression		
	Rocks		
	Precipice, Land slide		
	Cliff		
	Contour		
	Storages		
	Kabupaten boundary		





Table.3.3 LIST OF DESCRIPTION OF BENCH MARK

Station No.	Coordinate		
	S	E	Elevation
JP - 1	9232005.355	435766.571	0.922
JP - 2	9232696.656	438690.026	1.015
JP - 3	9232127.943	432863.829	0.926
JP - 4	9230302.409	437386.685	0.744
JP - 5	9228724.049	439082.492	2.999
JP - 6	9229090.580	433115.535	0.986
JP - 7	9228004.682	434777.817	4.362
JP - 8	9227769.510	436907.230	2.864
JP - 9	9226634.707	432582.980	33.702
JP - 10	9225629.837	439138.414	7.980
JP - 11	9225633.800	436807.341	14.416
JP - 12	9225529.384	434676.388	86.673
JP - 13	9224843.320	430487.409	60.949
JP - 14	9223654.478	432483.353	34.648
JP - 15	9223372.086	430551.770	80.953
JP - 16	9223202.529	428038.895	184.599
JP - 17	9220640.610	429241.207	204.198
JP - 18	9220624.395	425654.961	219.344
JP - 19	9219613.256	426540.307	218.583
JP - 20	9218360.583	427251.957	212.435
BM - 1			0.593
BM - 2			2.509
BM - 3			2.998
BM - 4			0.674
BM - 5			0.330
BM - 6			2.727
BM - 7			0.604
BM - 8			3.571
BM - 9			0.287
BM - 10			0.968
BM - 11			1.124
BM - 12			1.456
BM - 13	9230137.635	434905.154	0.349
BM - 14			0.892
BM - 15			0.567
BM - 16			5.023
BM - 17			1.604
BM - 18			2.103
BM - 19			2.687
BM - 20			3.460
BM - 21			4.495
BM - 22			7.497
BM - 23			6.672
BM - 24			1.459
BM - 25			2.792
BM - 26			3.141
BM - 27			2.387
BM - 28			1.549
BM - 29			2.540
BM - 30			7.028
BM - 31			88.542

Table 3.4 FINAL RESULT OF CONTROL POINTS

DATUM : WGS84  
 PROJECTION : U.T.M.  
 ZONE : 49  
 SEMI-MINOR AXI : 6,378,137.0000  
 MINI-MINOR AXI : 6,356,752.3143  
 FLATTERING : 298.2572236  
 SCALE FACTOR : 0.9996000  
 LATITUDE OF OR : 0° 0' 0" 0  
 LONGITUDE OF C : 111° 0' 0" 0

STATION	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEVATION	REMARKS
N.0004	7° 4' 7.081 " S	110° 28' 55.86 " S	9,218,632.118	442,814.138		
NI.0259 (JP-7)	6° 59' 1.564 " S	110° 24' 34.28 " S	9,228,004.682	434,777.817	4.362	
JP-1	6° 56' 51.33 " S	110° 25' 6.667 " S	9,232,005.355	435,766.570	0.922	
JP-2	6° 56' 3E+05 " S	110° 26' 41.96 " S	9,232,696.655	438,690.025	1.015	
JP-3	6° 56' 47.22 " S	110° 23' 32.08 " S	9,232,127.943	432,863.829	0.926	
JP-4	6° 57' 46.85 " S	110° 25' 59.4 " S	9,230,302.408	437,386.684	0.744	
JP-5	6° 58' 38.31 " S	110° 26' 54.6 " S	9,228,724.049	439,082.490	2.999	
JP-6	6° 58' 26.13 " S	110° 23' 40.15 " S	9,229,090.579	433,115.536	0.986	
JP-8	6° 59' 9.308 " S	110° 25' 43.67 " S	9,227,769.509	436,907.230	2.864	
JP-9	6° 59' 46.08 " S	110° 23' 22.69 " S	9,226,634.706	432,582.979	33.702	
JP-10	7° 0' 19.07 " S	110° 26' 56.31 " S	9,225,629.835	439,138.413	7.980	
JP-11	7° 0' 18.85 " S	110° 25' 40.33 " S	9,225,633.799	436,807.342	14.416	
JP-12	7° 0' 22.16 " S	110° 24' 30.88 " S	9,225,529.384	434,676.387	86.673	
JP-13	7° 0' 44.33 " S	110° 22' 14.32 " S	9,224,834.319	430,487.408	60.949	
JP-14	7° 1' 23.13 " S	110° 23' 19.32 " S	9,223,654.479	432,483.354	34.648	
JP-15	7° 1' 32.24 " S	110° 22' 46.35 " S	9,223,372.085	430,551.770	90.953	
JP-16	7° 1' 37.65 " S	110° 20' 54.44 " S	9,223,202.528	428,038.896	184.599	
JP-17	7° 3' 1.128 " S	110° 21' 33.51 " S	9,220,640.610	429,241.206	204.198	
JP-18	7° 3' 1.492 " S	110° 19' 36.62 " S	9,220,624.394	425,654.959	219.344	
JP-19	7° 3' 34.46 " S	110° 20' 5.429 " S	9,219,613.256	426,540.306	218.583	
JP-20	7° 4' 15.28 " S	110° 20' 28.57 " S	9,218,360.582	427,251.956	212.435	
BM-13	6° 57' 52.11 " S	110° 24' 38.52 " S	9,230,137.634	434,905.154	0.349	

Table 3.5 (1/3) LONGITUDINAL PROFILE - WEST FLOODWAY/GARANG RIVER

LINE	ACCV DS	DIS	LEFT				CENTER			RIGHT				Total WDTH	REMARKS		
			Elevation	3 WDTH	Back Land	Cut Crown	Rise Bank	Lowest	Water Level	Wdh	Rise Bank	Cut Crown	Back Land				Elevation
-9	-413.60	-13.70	0.64	58.10	0.63	0.63	0.63	-1.62	-0.40	361.18					361.18	780.46	97/9/30 11:45
-8	-399.90	-49.91	0.62	55.07	0.89	0.59	0.59	-1.44	-0.40	351.81					361.81	778.69	10:48
-7	-349.99	-47.97	0.50	53.50	1.04	0.77	0.77	-1.48	-0.43	350.22					380.22	813.94	
-6	-302.02	-54.05	0.89	52.78	1.09	0.75	0.75	-1.50	-0.40	350.39					380.39	813.56	10:25
-5	-247.97	-47.96	0.74	50.59	1.09	0.76	0.76	-1.68	-0.35	335.38					335.38	721.35	9:37
-4	-200.01	-50.02	0.82	49.59	1.02	0.75	0.75	-1.95	-0.52	337.82					337.82	725.23	9:00
-3	-149.99	-49.99	0.90	50.13	1.02	0.72	0.72	-2.02	-0.46	289.56					289.56	629.25	97/9/29 14:18
-2	-100.00	-50.01	1.12	49.92	1.07	0.75	0.75	-2.06	-0.49	274.50					274.50	593.92	13:34
-1	-49.99	-49.99	0.40	52.86	1.17	0.40	0.40	-2.02	-0.38	374.08					374.08	801.02	11:47
0	0.00	0.00	0.46	54.40	0.41	0.40	0.40	-2.17	-0.36	205.21	0.08			0.21	53.81	313.42	10:35
1	47.39	47.39	0.48	52.61	0.37	0.40	0.40	-2.26	-0.33	181.87	-0.01	0.72	0.00	0.78	52.55	287.03	97/07/28 8:20
2	93.33	45.95	0.41	53.77	0.29	0.41	0.41	-2.56	-0.31	179.81	-0.03	0.35	-0.16	0.29	59.27	292.85	9:10
3	144.93	51.64	0.69	50.00	1.57	1.57	0.48	-2.86	-0.30	164.07	-0.03	0.63	0.02	0.70	57.51	271.58	10:30
4	198.25	53.27	1.05	51.48	1.71	1.69	0.81	-2.78	-0.26	154.38	0.01	0.63	-0.22	0.69	57.90	263.76	
5	258.96	60.71	1.16	51.41	2.69	1.78	0.91	-2.96	-0.17	151.02	0.66	0.75	0.55	0.83	55.95	258.38	97/07/28 13:26
6	311.85	52.89	1.27	50.00	2.96	2.08	0.93	-2.95	-0.28	121.40	1.29	1.59	0.83	1.65	51.78	223.18	14:15
7	357.06	45.20	1.15	50.00	2.06	1.84	0.73	-3.20	-0.33	121.11	0.52	1.87	1.07	1.93	42.47	213.58	
8	408.50	51.44	1.13	50.00	2.00	1.79	0.85	-3.21	-0.37	120.33	0.45	2.40	1.16	2.27	53.52	223.85	97/07/28 15:22
9	455.58	47.09	0.88	50.00	2.06	1.87	0.53	-3.22	-0.42	118.06	0.24	2.73	1.14	2.78	52.83	220.89	
10	506.02	50.44	0.65	50.00	2.13	1.85	0.25	-3.28	-0.33	124.66	0.15	2.47	0.62	2.57	51.79	226.45	97/07/29 8:10
11	553.89	47.87	0.46	50.00	2.16	1.89	-0.11	-3.28	-0.37	129.95	0.12	2.09	0.50	2.14	51.50	231.45	
12	605.20	51.31	0.21	50.00	1.44	1.44	0.21	-3.22	-0.32	157.77	0.41	0.72	0.16	0.71	52.34	260.11	97/07/29
13	656.93	51.73	1.78	52.61	2.00	2.01	1.32	-3.26	-0.35	149.87	0.03	1.20	0.48	1.25	52.47	254.95	10:50
14	701.67	44.74	1.40	51.57	0.62	1.92	1.32	-3.52	-0.42	150.17	0.17	1.63	0.25	1.54	55.93	257.67	11:30
15	760.78	59.11	0.41	65.29	-0.04	1.04	0.24	-4.66	-0.22	140.39	0.71	2.57	4.17	0.34	81.28	306.96	Bridge 1997/7/30 9:40
16	817.01	56.23	0.05	50.00	0.77	0.96	0.14	-3.12	-0.33	149.15	0.40	1.61	0.14	0.63	40.94	240.09	
17	863.11	46.10	0.31	50.00	0.63	1.05	0.49	-3.24	-0.34	145.53	0.31	1.61	-0.09	0.93	54.73	250.26	97/07/29 14:30
18	913.43	50.32	0.85	50.00	0.74	1.38	0.10	-2.75	-0.30	145.04	0.41	1.61	0.17	1.04	59.67	254.71	
19	974.54	61.11	0.24	50.00	1.00	1.65	0.22	-3.41	-0.37	138.16	0.04	1.55	0.34	1.06	57.13	245.29	97/07/29 15:20
20	1020.98	46.44	1.27	50.00	1.01	1.54	0.13	-3.03	-0.40	143.97	0.17	1.58	0.06	1.04	53.67	247.64	97/07/31 10:10
21	1072.80	51.83	1.32	50.00	0.97	1.50	0.54	-2.76	-0.33	150.10	0.03	1.62	0.39	1.19	58.32	258.42	97/07/30 11:45
22	1123.92	51.12	1.93	50.00	0.96	1.57	0.34	-2.75	-0.43	158.15	0.21	1.66	0.05	1.33	53.08	261.23	
23	1174.65	50.73	1.18	50.03	0.94	1.73	0.68	-2.55	-0.37	163.65	0.17	1.72	0.17	1.12	57.89	271.57	97/08/01 9:58
24	1221.11	46.46	1.25	50.00	0.97	1.65	0.39	-2.55	-0.36	169.27	0.25	1.75	0.45	1.44	51.44	270.71	
25	1265.96	44.85	1.26	51.91	1.00	1.65	0.43	-2.51	-0.41	171.00	0.46	1.83	0.17	1.44	54.85	277.76	97/07/30 13:55
26	1315.62	49.65	1.11	50.00	1.02	1.82	0.36	-2.75	-0.35	168.66	0.32	1.85	0.15	1.20	46.01	264.67	14:30
27	1369.02	53.40	1.16	50.00	0.84	1.78	0.29	-2.74	-0.10	168.21	0.41	1.84	0.07	1.51	53.43	271.84	
28	1422.31	53.29	1.00	50.00	0.80	1.79	0.29	-2.75	-0.12	170.76	0.29	1.85	0.13	1.40	71.59	292.35	97/07/31 11:05
29	1474.70	52.40	1.35	50.12	0.94	1.98	0.70	-2.78	-0.18	163.22	0.16	1.90	0.30	1.48	54.89	268.33	13:15
30	1527.12	52.42	0.61	50.00	0.55	2.25	0.52	-2.65	-0.21	165.26	0.64	1.88	0.03	1.07	56.70	271.96	97/08/11 14:45
31	1582.05	54.92	0.77	55.84	0.51	2.26	0.17	-2.78	-0.28	170.75	0.28	1.92	0.01	1.02	54.52	281.11	97/07/31 15:00
32	1634.82	52.78	0.88	54.73	0.59	2.20	0.93	-2.84	-0.28	184.68	0.27	1.84	0.82	1.93	53.51	292.92	
33	1688.29	53.47	1.23	53.48	0.73	2.24	0.50	-2.91	-0.28	180.67	0.40	2.11	0.22	1.22	55.77	289.92	97/07/31 15:45
34	1742.59	54.30	1.93	50.00	0.56	1.85	0.49	-2.27	-0.14	185.00	0.44	2.16	0.28	1.32	57.72	292.72	97/08/02 13:12
35	1786.55	43.97	1.43	51.40	0.51	1.92	0.49	-2.89	-0.10	185.62	0.47	2.20	0.50	1.32	55.03	292.65	14:00
36	1830.68	44.13	0.96	54.03	0.71	2.18	0.56	-2.95	-0.15	184.48	0.49	2.20	0.48	1.55	56.76	295.27	14:59
37	1879.83	49.15	1.12	50.00	0.71	2.17	0.91	-2.77	-0.25	188.67	0.60	2.31	0.43	1.50	52.64	291.31	97/08/04 8:15
38	1928.79	48.96	1.37	50.00	0.73	2.20	0.65	-2.51	-0.28	192.60	0.32	2.41	0.29	2.15	44.16	286.76	8:46
39	1983.84	55.05	1.09	50.00	0.79	2.34	0.91	-2.24	-0.32	190.92	0.63	2.39	0.96	1.22	50.33	291.25	9:20
40	2029.18	45.35	1.06	50.00	0.83	2.28	0.64	-2.47	-0.32	190.81	0.52	2.42	0.98	1.13	54.64	295.45	
41	2082.46	53.28	1.23	57.68	1.08	2.39	0.71	-2.33	-0.25	175.54	0.68	2.36	1.04	0.37	58.32	291.54	97/08/04 10:25
42	2133.69	51.22	0.93	59.47	0.98	2.47	0.73	-2.16	-0.32	175.19	0.63	2.52	1.12	1.19	59.52	294.18	11:30
43	2181.60	47.92	1.23	53.91	1.11	2.50	0.82	-2.06	-0.32	170.43	0.82	2.51	1.14	0.70	43.85	268.19	14:30
44	2232.03	50.42	1.20	49.85	1.33	2.64	1.06	-2.17	-0.29	162.26	0.53	2.61	1.33	1.11	35.16	247.27	15:30
45	2284.62	52.60	1.24	54.08	1.48	2.62	1.22	-2.21	-0.32	147.51	0.49	2.62	1.45	0.31	39.55	241.14	97/08/05 8:18
46	2335.93	51.30	1.52	54.91	1.70	2.81	1.60	-2.30	-0.20	148.79	0.73	2.65	1.60	0.94	43.56	247.26	8:57
47	2383.07	47.14	1.65	39.17	1.93	3.00	1.33	-2.47	-0.17	144.88	0.51	2.73	1.66	0.90	16.59	200.64	9:45
48	2434.61	51.54	2.28	41.91	1.88	3.05	2.16	-2.18	-0.21	143.06	0.73	2.80	1.77	2.52	11.12	196.09	
49	2486.34	51.74	2.10	50.00	1.99	3.31	0.83	-2.38	-0.40	137.42	0.96	2.88	1.92	1.65	15.07	202.49	97/08/05 10:12
50	2534.97	48.62	2.03	38.82	1.80	2.97	2.19	-2.25	-0.21	130.79	0.63	2.97	2.04	1.27	18.09	187.70	11:23
51	2583.17	43.21	2.27	50.00	1.84	3.14	2.23	-2.18	-0.35	127.71	0.75	3.03	2.09	1.60	13.24	190.95	14:15
52	2632.52	49.35	2.20	54.99	1.80	3.19	2.27	-2.14	-0.37	123.04	0.97	3.08	2.04	3.32	27.24	205.27	15:30
53	2684.54	52.02	2.33	50.00	1.79	3.03	2.37	-2.13	-0.35	118.59	0.91	3.09	2.12	2.55	33.85	202.44	97/08/06 8:20
54	2736.95	52.41	1.81	52.66	1.99	3.29	0.95	-2.36	-0.46	112.88	1.05	3.22	2.12	1.34	41.90	207.44	11:45
55	2785.26	48.31	1.38	58.03	1.91	3.10	1.11	-1.95	-0.21	107.59	0.85	3.32	2.10	2.16	17.36	182.96	14:17
56	2835.52	50.27	1.99	50.00	2.40	3.27	0.89	-2.19	-0.53	105.97	1.56	3.31	2.33	2.33	15.59	171.56	15:12
57	2885.81	50.28	2.25	50.00	2.67	3.24	0.83	-2.02	-0.52	94.47	1.39	3.46	2.54	1.41	52.55	197.02	16:00
58	2937.66	52.05	2.23	28.73	2.52	3.22	1.12	-2.20	-0.48	95.54	0.66	3.52	2.69	2.38	43.65	167.92	97/08/07 8:20
59	2985.06	47.21	2.60	54.18	2.77	3.41	0.84	-2.28	-0.53	89.45	1.23	3.45	2.73	2.63	17.15	160.78	9:31

Table 3.5 (2/3) LONGITUDINAL PROFILE - WEST FLOODWAY/GARANG RIVER

LINE	ACCV DIS	DIS	LEFT						CENTER			RIGHT					Total WIDTH	REMARKS	
			Elevation	3 w/dth	Back Land	Chk Own	River Bank	Lowest	Water Level	W/ath	River Bank	Chk Own	Back Land	Elevation	3 w/dth				
60	3035.36	50.29	2.67	50.00	3.03	3.40	0.20	-2.31	-0.55	87.80	0.78	3.59	2.91	2.24	15.81	153.61			
61	3088.42	53.06	2.76	50.00	3.06	3.54	1.27	-2.64	-0.52	86.13	0.52	3.62	2.91	2.04	55.51	191.64	97/08/11	8:30	
62	3137.35	48.94	2.71	50.00	3.05	3.59	0.28	-2.68	-0.49	85.06	0.99	3.68	3.17	2.29	33.41	168.47	97/08/07	11:39	
63	3185.08	47.72	3.15	50.00	3.22	3.65	0.89	-2.64	-0.47	86.54	1.52	3.65	3.30	2.45	59.08	189.62		14:01	
64	3238.94	51.87	1.87	50.00	3.42	3.79	1.55	-2.78	-0.51	84.78	1.55	3.84	3.79	3.20	31.28	166.06		14:36	
65	3266.56	49.61	4.59	205.08	4.59	4.59	0.28	-2.11	-0.43	98.10	1.62	4.69	4.69	4.63	210.57	513.75	Rail Way	15:30	
66	3337.22	50.67	4.36	50.00	4.47	4.36	0.48	-2.29	-0.46	86.83	1.63	4.20	4.28	3.55	14.94	151.77			
67	3389.61	52.39	4.37	56.22	4.52	4.24	1.36	-2.41	-0.48	84.67	1.41	4.19	4.26	3.95	13.37	154.46	97/08/11	9:10	
68	3436.61	46.99	4.66	50.70	4.65	4.52	0.36	-2.27	-0.42	83.10	1.56	4.13	4.12	4.21	15.13	148.93		8:45	
69	3485.98	49.37	4.57	50.00	4.87	4.47	0.95	-2.67	-0.45	86.98	1.83	3.97	4.06	3.56	24.59	161.57	97/08/11	10:41	
70	3536.62	50.64	4.99	50.00	4.68	4.90	1.15	-2.86	-0.50	91.01	1.84	3.96	4.05	3.74	45.17	186.18		11:25	
71	3587.68	51.06	4.74	50.00	4.73	4.69	1.28	-3.05	-0.47	85.74	1.97	3.93	3.78	3.28	38.28	174.02		13:22	
72	3643.16	56.49	2.19	44.69	4.98	5.51	1.60	-4.47	-0.51	73.70	1.49	4.07	4.12	2.50	40.70	159.09	97/08/12	8:45	
72+22	3671.98	28.81			69.51	6.28	4.28	1.42	-3.22	0.28	65.38	1.85	4.24	6.24	2.16	68.01	202.90	Bridge	9:35
72+39	3688.12	16.14			57.63	6.04	4.09	2.14	-2.82	0.26	67.28	1.42	4.09	6.10	2.48	55.58	180.49	Bridge	9:55
74	3740.58	43.97	4.41	50.00	4.14	4.36	1.73	-1.91	-0.45	87.45	1.96	4.55	4.74	4.63	14.33	151.78		10:40	
75	3789.75	49.18	4.14	50.00	4.04	4.06	1.17	-2.08	-0.41	73.97	1.83	4.93	5.13	4.24	14.78	138.75		11:15	
76	3839.65	49.90	4.28	34.09	4.23	4.18	2.26	-2.21	-0.42	75.32	2.32	5.16	5.28	4.82	28.10	137.51		13:10	
77	3891.93	52.28	4.51	50.00	4.38	4.23	1.67	-2.35	-0.45	84.00	1.77	4.97	5.18	5.10	26.10	160.10			
78	3938.28	48.35	4.69	50.00	4.39	4.59	2.41	-2.32	-0.48	83.71	3.03	5.35	5.38	5.47	16.14	149.85	97/08/12	14:00	
79	3985.68	47.40	4.34	50.00	4.52	4.31	2.41	-2.19	-0.55	81.22	1.41	5.35	5.47	5.45	22.87	154.09		14:30	
80	4041.74	56.06	4.19	52.13	4.84	4.08	2.52	-1.94	-0.49	85.19	0.61	5.31	5.43	5.38	20.01	157.33	97/08/13	8:00	
81	4091.82	50.08	4.57	50.00	4.95	4.49	2.97	-1.86	-0.48	86.18	0.64	5.44	5.54	5.58	20.86	157.04			
82	4140.38	43.56	5.39	50.00	5.33	5.35	3.14	-1.99	-0.54	89.31	0.69	5.57	5.65	5.65	10.79	150.10	97/08/13		
83	4191.07	50.69	5.10	50.00	5.43	5.07	3.19	-2.06	-0.61	87.89	1.38	5.81	5.84	5.91	24.06	161.95			
84	4239.71	48.65	5.52	50.00	5.48	5.40	3.13	-1.90	-0.50	92.40	1.47	5.85	5.84	5.94	51.23	193.63			
85	4293.88	54.17	5.07	50.00	5.38	5.02	3.11	-1.74	-0.46	88.50	1.86	5.87	5.96	6.03	10.31	148.81			
86	4343.93	50.05	5.66	50.00	5.54	5.53	3.05	-1.90	-0.17	92.63	2.22	6.17	6.08	6.28	23.18	165.86			
87	4391.70	47.77	5.50	50.00	5.59	5.43	1.82	-1.90	-0.21	86.77	2.27	5.91	5.99	6.03	12.50	149.27	97/08/14		
88	4441.74	50.04	5.41	50.00	5.59	5.30	1.52	-1.81	-0.21	87.34	1.54	5.97	5.99	5.69	12.02	149.36	97/08/14		
89	4491.47	49.73	5.74	50.00	5.63	5.63	3.14	-1.86	-0.22	88.93	1.60	6.07	6.14	6.12	12.39	151.32			
90	4541.75	50.27	5.71	50.00	5.78	5.63	2.09	-1.94	-0.28	83.68	1.51	5.84	6.25	5.92	22.95	156.63	97/08/13	11:05	
91	4595.22	53.47	5.52	50.00	5.71	5.42	2.26	-2.00	-0.26	91.01	1.71	6.30	6.43	6.35	9.22	150.23			
92	4645.57	50.35	5.78	50.00	5.73	5.65	2.94	-2.11	-0.25	89.43	1.84	6.21	6.41	6.31	21.00	160.43			
93	4694.11	48.54	5.77	26.18	6.01	6.01	2.70	-1.76	-0.46	90.24	1.57	6.53	6.52	6.63	28.09	144.51			
94	4742.15	48.03	6.95	34.51	6.94	6.98	2.79	-2.06	-0.50	84.54	1.68	6.55	6.71	6.60	17.07	136.12	97/08/13	14:00	
94+23	4768.54	26.40	3.65	56.61	6.95	3.95	3.95	-2.90	-0.24	69.81	4.62	6.62	6.65	3.87	60.48	185.90	Bridge	15:00	
95	4794.59	26.05	6.18	27.31	7.39	6.08	2.85	-1.32	-0.46	93.36	6.49	6.62	6.70	6.70	11.17	131.84	97/08/16	8:10	
96	4841.29	46.69	8.35	35.50	8.51	6.28	2.62	-1.12	-0.15	98.63	4.05	6.85	7.11	7.06	7.75	142.28		8:47	
97	4891.88	50.59	6.74	29.55	8.73	6.63	1.79	-1.34	-0.18	99.21	3.91	7.42	7.52	7.55	14.31	143.07		9:45	
98	4943.79	51.92	6.74	21.52	7.58	6.83	3.01	-2.80	-0.10	100.47	5.05	7.97	8.33	8.09	34.86	156.85		10:17	
98+21																		10:55	
98+23																		11:35	
99	4994.19	50.40	7.50	41.32	8.91	7.42	5.96	1.54	1.68	101.61	5.88	9.16	9.36	8.88	41.91	184.84		13:20	
99+29	5023.04	28.85	8.49	31.24	8.53	8.43	8.43	5.16		92.96	8.41	8.41	7.41	8.61	31.70	155.90	Simongan Weir	14:00	
99+29																		15:02	
100	5045.21	22.17	8.63	12.21	8.54	9.37	9.37	1.10	4.94	87.08	5.94	9.42	8.60	8.60	34.23	133.52	97/08/18	8:00	
101	5095.03	49.82	9.44	1.57	10.20	9.44	6.90	3.57	4.97	76.94	6.96	9.97	9.45	7.18	16.37	94.88		8:42	
102	5149.08	54.05	9.31	16.51	9.26	10.19	6.37	3.54	4.97	76.71	6.84	10.00	9.55	7.58	29.28	122.50		9:20	
103	5200.15	51.07	9.64	14.22	9.56	10.29	6.48	3.65	5.00	86.51	7.16	10.08	9.59	7.61	17.04	117.77		10:30	
104	5258.51	58.36	9.16	11.85	8.59	10.28	5.71	3.77	5.01	72.98	7.42	10.19	9.63	7.92	20.63	105.46		11:15	
105	5309.05	50.54	9.28	17.69	8.78	10.35	8.34	4.30	5.03	70.42	7.65	10.22	9.65	8.05	77.49	165.60		13:10	
106	5356.47	47.42	9.18	13.15	9.04	10.43	8.05	4.21	5.05	68.73	8.96	10.34	9.53	9.08	28.32	110.20		14:00	
107	5408.49	52.02	9.71	14.38	9.50	10.47	7.01	3.96	5.12	69.29	7.00	11.42	10.78	7.60	24.93	108.80	97/08/19	8:10	
108	5462.44	53.95	11.03	21.25	10.95	10.50	7.80	3.38	5.10	74.77	8.82	11.96	11.58	11.89	40.26	136.28		10:15	
109	5505.67	43.23	13.22	20.01	13.52	13.12	7.67	3.20	5.13	77.96	12.04	12.46	12.04	12.51	20.77	118.74		11:10	
110	5555.14	49.48	14.00	34.51	13.88	13.91	9.43	3.66	5.12	59.08	12.28	12.51	12.23	12.60	16.89	110.48		14:20	
111	5603.48	48.32	11.86	13.34	12.32	11.85	7.06	2.80	5.08	74.59	10.02	10.38	10.51	10.43	43.06	130.99	97/08/20	8:30	
112	5636.39	32.93	10.49	39.26	8.13	10.35	7.30	1.78	5.08	98.67	6.49	10.64	8.40	9.97	29.36	167.29			
113	5675.83	39.45	11.11	23.30	8.19	10.48	7.10	3.45	4.99	127.34	8.90	10.65	9.32	9.47	36.61	178.25	97/08/20		
114	5710.76	34.92	11.17	23.15	8.27	10.18	7.18	3.02	4.93	175.82	7.08	10.77	9.33	9.45	74.12	273.09			
115	5741.29	30.54	11.23	9.50	8.44	10.61	7.58	3.09	4.99	232.84	7.74	10.65	10.55	7.74	14.79	257.13			
116	5781.40	40.11	11.29	29.37	8.77	10.89	7.12	2.87	4.95	262.21	8.44	10.72	10.83	10.81	57.77	349.35			
117	5822.78	41.38	10.90	38.65	8.01	10.79	7.58	2.29	5.11	265.76	7.64	10.89	11.14	11.01	26.28	330.67			
118	5861.13	38.35	10.85	53.79	7.81	10.71	7.15	2.25	5.16	254.71	9.14	9.31	11.00	9.20	17.40	325.90			
119	5888.82	37.68	10.66	53.66	7.97	10.76	7.91	2.85	5.15	250.60	9.25	9.74	10.61	9.72	3.85	308.11	97/08/20		
120	5937.01	38.20	10.34	61.85	8.04	11.00	8.87	3.96	5.12	251.24	6.94	11.01	10.01	11.05	20.85	333.94			
121	5975.45	38.44	10.28	12.45	8.88	11.03	9.02	4.37	5.00	252.66	7.34	10.76	9.51	10.83	26.88	291.99			
122	6013.23	37.78																	

Table 3.5 (3/3) LONGITUDINAL PROFILE - WEST FLOODWAY/GARANG RIVER

LINE	ACCM DIS	DIS	LEFT					CENTER					RIGHT					Total	REMARKS
			Elevation	1 wth	Back Land	Ch Green	River Bank	Lowest	R/R Lead	Wth	River Bank	Ch Green	Back Land	Elevation	1 wth	W/DTH			
123	6045.51	32.27	10.30	58.81	8.72	11.07	7.29	4.29	5.20	200.95	7.49	11.26	9.82	11.33	7.76	267.52			
124	6076.38	30.87	11.27	52.70	10.13	11.10	7.83	4.38	5.17	152.63	7.83	11.18	8.32	11.25	10.20	215.53			
125	6109.17	32.80	11.38	50.00	10.50	11.19	7.31	4.45	4.94	113.60	7.35	11.13	8.67	11.20	12.32	175.92	97/08/20		
126	6160.80	51.63	11.08	32.06	10.26	11.03	7.37	3.63	4.92	91.05	7.64	11.22	9.35	11.34	11.55	134.66			
127	6210.71	49.91	11.02	22.51	10.68	11.02	8.44	3.96	4.95	111.31	7.61	10.91	8.11	11.01	96.94	230.76			
128	6249.81	39.09	11.14	28.81	10.48	11.14	6.68	4.18	4.94	136.57	6.39	10.83	7.70	10.69	19.18	184.56			
129	6288.18	38.33	11.22	40.33	11.12	11.58	7.60	3.61	4.94	157.46	6.71	11.11	8.08	11.12	37.81	235.60			
130	6317.68	29.50	10.45	22.90	11.19	11.55	8.02	2.38	5.08	158.64	7.81	11.14	7.65	11.21	49.11	230.65			
131	6363.16	45.49	10.88	53.70	11.15	11.50	7.56	2.72	5.03	174.66	6.82	11.46	8.20	11.56	48.76	277.32			
132	6393.89	30.73	10.59	52.87	10.59	11.53	7.24	4.06	5.08	185.51	7.93	11.52	7.64	11.60	33.18	271.56	9.50		
133	6431.27	37.38	11.59	41.79	9.41	11.43	8.42	4.17	5.07	152.19	7.77	8.70	8.47	8.71	36.26	230.24	10.54		
134	6473.01	41.74	11.59	55.42	9.12	11.47	8.10	3.73	5.14	143.17	7.57	11.11	8.58	11.23	55.46	254.05	11.35		
135	6544.98	71.97	11.76	56.25	9.18	11.61	7.84	3.95	5.06	103.69	8.84	11.25	10.06	11.40	10.58	170.52	13.90		
136	6603.18	58.20	12.59	60.48	8.94	12.45	10.09	4.11	4.98	122.06	7.63	10.27	10.04	8.90	14.78	197.32	14.35		
137	6692.88	89.68	13.35	59.58	9.11	13.23	10.95	4.25	5.01	222.99	10.94	11.68	12.19	7.84	54.00	336.55	97/08/28 8.20		
138	6765.34	72.48	13.58	34.91	10.45	13.38	10.62	4.37	5.11	307.60	9.25	12.76	12.83	12.85	33.13	375.64	9.30		
139	6827.08	61.75	12.23	51.14	12.61	12.03	11.67	4.40	5.20	299.95	9.81	11.13	10.62	12.72	25.89	376.98	97/08/28 11:15		
140	6888.68	61.59	13.21	51.15	9.86	13.12	7.40	4.80	5.22	316.55	8.73	11.30	9.72	9.96	14.70	382.40			
141	6947.75	59.07	12.53	62.66	9.87	12.42	8.81	4.13	5.22	229.04	8.48	12.37	8.98	12.77	44.29	336.19			
142	7034.14	86.39	11.73	48.67	10.98	11.63	7.26	4.39	5.27	118.95	8.67	12.71	9.27	12.68	50.45	218.07			
143	7107.20	73.06	10.14	43.05	10.19	10.07	7.09	3.71	5.21	87.65	8.56	12.96	9.23	13.09	55.02	165.72			
144	7163.44	56.24	11.31	4.44	11.95	11.19	7.74	3.16	5.21	87.28	8.00	12.99	10.56	12.98	41.51	133.23	97/08/30 8.50		
145	7210.33	46.89	11.41	34.56	11.61	11.33	6.19	3.89	5.19	104.61	8.10	13.22	11.38	13.37	49.27	188.44	10.40		
146	7246.51	36.18	10.13	31.34	10.23	10.05	5.77	4.48	5.19	96.62	9.25	13.31	11.93	13.41	55.39	183.35			
147	7283.95	42.44	10.38	51.26	11.48	12.03	5.99	4.31	5.24	87.41	8.84	13.11	11.91	13.18	50.14	188.81	14.27		
148	7339.25	50.31	12.11	51.20	11.78	12.02	5.58	3.45	5.21	84.60	8.34	13.48	11.99	13.54	53.55	169.35	15.50		
149	7397.24	57.98	10.94	48.86	11.88	12.47	8.49	3.76	5.27	76.36	9.23	13.37	12.32	13.47	52.48	177.70	97/10/07 14:58		
150	7438.74	41.51	11.19	53.11	11.38	12.45	7.44	3.12	5.29	80.22	7.83	14.31	12.96	11.18	18.07	151.40	97/10/08 10:15		
151	7472.17	33.43	10.42	42.76	11.50	12.50	9.80	4.63	5.26	77.15	8.45	13.28	11.78	13.41	49.14	169.05			
152	7498.70	26.53	11.32	38.63	11.62	12.58	11.25	4.87	5.27	81.48	8.18	13.38	11.03	13.39	53.13	173.24	97/08/29 9.50		
153	7539.62	40.92	11.66	69.12	11.64	12.70	10.81	4.84	5.33	78.38	8.04	13.49	11.28	13.48	50.40	197.90	8.25		
154	7585.42	45.81	8.57	76.33	11.58	12.74	7.92	4.62	5.28	48.90	10.10	13.53	12.04	13.60	46.42	171.65	97/08/09 9.40		
155	7637.18	51.76	8.66	99.00	11.74	12.72	8.51	4.36	5.30	57.17	10.35	13.81	11.28	13.83	66.68	223.05	10.15		
156	7691.72	54.54	8.91	83.85	11.31	12.14	8.82	4.42	5.31	70.27	10.89	13.92	11.53	13.96	56.55	210.67	10.40		
157	7747.79	56.07	8.97	66.92	11.92	12.79	8.12	4.57	5.32	75.16	11.03	14.15	10.89	14.14	54.16	196.24	12.20		
158	7798.02	50.23	9.12	45.28	12.26	12.86	9.02	4.60	5.31	80.57	8.60	14.20	12.46	14.17	52.55	178.40	13.45		
159	7846.60	48.58	9.65	26.44	13.04	13.19	9.56	4.62	5.32	80.32	7.83	14.32	12.05	14.34	40.32	147.08			
160	7906.16	59.56	9.32	41.31	13.50	13.39	10.51	5.08	5.33	85.92	11.16	14.31	10.97	14.48	49.43	176.66			
161	7938.17	32.01	11.04	38.38	14.58	15.48	10.09	4.53	5.40	88.59	8.95	14.24	10.74	14.24	54.41	179.38	97/08/09		
162	7994.54	56.37	14.57	49.11	14.78	14.50	10.68	4.16	5.45	99.22	11.04	14.39	10.95	14.35	38.36	166.69	97/08/26 10:10		
163	8046.89	52.35	9.91	38.64	15.54	15.40	9.77	4.99	5.47	91.88	10.97	14.52	11.65	14.52	25.32	155.84	15:10		
164	8084.88	37.99	10.01	34.78	15.28	14.88	9.83	5.61	5.99	95.51	9.57	14.30	11.25	14.30	26.54	158.83			
164+28	8112.88	28.00	14.92	11.48	15.10	14.91	9.77	5.43	6.04	107.87	10.10	14.12	11.15	14.13	52.12	171.47	Water Gauge 1997/8/27 9:10		
165	8124.47	39.59	10.17	32.08	14.98	14.98	9.90	5.17	6.09	65.80	9.97	14.20	14.20	14.25	57.35	175.21			
166	8148.41	23.94	11.50	46.70	14.20	11.41	7.99	5.23	6.07	92.32	10.38	14.25	11.03	14.27	38.52	177.54			
167	8193.47	45.06	10.80	51.27	10.54	10.52	9.13	5.03	6.10	83.83	10.77	14.03	11.16	14.09	33.90	169.00	13:45		
168	8238.00	44.53	9.81	48.39	9.77	9.73	9.73	5.21	6.11	66.79	10.81	14.07	11.38	14.07	8.91	124.09			
169	8293.09	55.09	9.31	48.85	11.65	9.18	9.18	5.23	6.12	68.47	10.38	14.14	11.71	14.20	55.64	172.96	97/08/26 14:10		
170	8346.53	53.44	9.48	44.85	11.96	9.40	9.40	4.97	6.15	78.00	10.34	14.21	12.17	14.26	54.47	177.32	97/09/05 9:45		
171	8401.51	54.98	9.53	47.66	10.38	9.24	9.24	5.21	6.06	79.40	9.36	14.18	11.71	14.28	57.78	184.84			
172	8451.00	49.49	9.53	54.00	9.78	9.71	8.20	5.06	6.06	82.48	9.29	14.19	12.61	14.31	15.14	151.62			
173	8514.07	63.07	10.32	53.44	10.88	10.19	10.19	5.03	6.05	89.54	9.36	14.28	12.28	14.34	57.37	200.35	97/08/27 8:55		
174	8566.64	52.58	10.56	57.12	11.10	10.46	10.21	4.81	6.07	104.39	9.51	14.47	12.47	11.83	40.99	202.50	14:35		
174+18	8584.64	18.00	10.20	95.34	11.09	10.20	9.00	6.12	4.89	64.80	9.52	9.73	10.85	9.73	95.40	255.34	Toll Way 1997/9/2 10:58		
175	8617.71	33.07	10.94	50.28	11.66	10.88	10.88	5.26	6.37	114.40	9.48	11.72	12.70	12.88	27.04	191.72	97/08/25 13:50		
176	8659.64	41.94	12.21	54.94	12.18	11.98	8.92	5.91	6.61	75.25	9.52	10.21	13.36	10.58	10.03	140.22	13:16		
177	8708.98	49.33	12.40	15.22	13.08	12.28	12.28	5.96	6.65	65.04	9.58	11.50	12.61	10.67	6.08	86.34	11:30		
178	8763.68	55.00	13.09	37.83	13.00	12.97	12.97	5.81	6.78	93.44	10.77	12.27	11.87	12.01	60.90	192.17	11:14		
179	8822.00	58.02	13.70	53.92	13.57	13.73	13.73	6.42	7.00	98.23	10.24	11.69	11.96	11.80	27.33	179.48			
180	8851.65	29.65	12.15	55.19	12.14			6.54	6.79	93.45			11.75	11.83	51.81	200.45	97/10/28 15:14		
181	8893.05	41.40	12.54	56.82	12.51			6.42	6.97	69.67			12.23	12.32	28.24	154.73	14:40		
182	8937.18	44.13	13.00	52.83	12.97			6.56	7.07	53.83			12.01	12.11	6.72	113.38	11:43		
183	8989.51	51.34	11.82	29.98	11.54			6.51	7.21	50.50			12.06	12.01	11.68	92.16	11:11		
184	9035.64	47.13	11.92	4.51	11.89			6.78	7.42	37.42			12.74	12.88	14.47	56.40	10:54		
185	9082.44	48.79	11.74	1.74	11.67			7.52	7.72	40.66			13.68	13.97	22.78	65.18	10:34		
186	9129.84	47.40	10.53	6.81	12.65			7.28	7.76	32.37			14.37	14.43	6.81	45.99	10:13		
186+27	9158.67	26.83	16.98	49.83	9.27			8.82	9.10	41.62			16.97	17.00	62.23	153.68	9:55		
186+35	9165.16	8.50	17.96	58.70															

Table 3.6 LONGITUDINAL PROFILE - CENGKEK RIVER

LINE	DISTANCE	ACCM.DIS	LEFT			CENTER			RIGHT			Total WIDTH	REMARKS	
			Elevation	Δ width	Backland	Lowest	Water Level	Width	River Bank	Dike Crown	Back Land			Elevation
0	0.00	0.00	7.00	15.01		4.99	5.15	22.58			6.33	38.98	76.57	
0+28	34.76	34.78	6.13	14.29	7.00	5.18	5.30	12.51			8.31	19.78	46.58	
1	25.02	59.78	7.28	17.10	7.06	5.33	5.65	18.88			8.16	15.02	51.00	
2	50.07	109.85	7.53	14.85	7.47	5.45	5.71	11.99			7.30	16.82	43.66	
3	48.19	158.04	8.49	11.37	8.31	5.74	5.91	25.87			8.32	16.19	53.43	
4	51.35	209.38	8.87	11.71	10.75	5.90	6.24	16.95		11.50	10.72	11.61	40.27	
5	44.60	253.99	9.16	1.04	7.94	6.30	6.30	19.71			6.70	6.91	22.03	
5+22	22.00	275.99	10.42	11.90	10.33	6.36	6.48	15.81		10.42	10.25	10.42	23.19	50.90
6	23.26	299.25	8.83	0.61	8.83	6.63	6.75	11.54			9.20	8.25	14.09	
7	50.19	349.42	8.55	0.82	8.27	6.99	7.11	12.31			9.39	9.52	15.49	
8	49.90	399.32	10.31	25.95	10.20	7.21	7.32	19.15		10.78	10.75	16.92	62.02	
8+5	5.00	304.32	10.52	14.88	10.29	7.22	7.33	18.67		10.70	11.89	10.70	49.15	
9	47.99	452.31	10.49	22.06	10.45	7.29	7.50	18.02			10.64	10.37	40.75	
9+28	28.00	280.31	11.11	21.78	10.74	7.99	8.07			11.47	11.47	9.90	31.66	
10	19.27	499.58	10.99	12.78	10.95	7.82	8.11	13.10			8.34	10.99	26.30	

Table 3.7 LONGITUDINAL PROFILE - KALITO RIVER

LINE	DISTANCE	ACCM.DIS	LEFT			CENTER			RIGHT			Total WIDTH	REMARKS	
			Elevation	Δ width	Backland	Lowest	Water Level	Width	River Bank	Dike Crown	Back Land			Elevation
0	0.00	0.00	7.95	16.23	7.92	5.78	6.11	20.16			12.52	8.13	44.52	
1	57.64	57.64	9.76	9.48	10.24	5.92	6.17	26.49			9.96	9.22	44.01	
2	49.96	107.61	10.18	4.62	10.11	6.06	6.35	23.98						
2+27	27.00	134.61	11.88	24.77	11.78	6.55	6.68	10.53			11.78	11.90	28.60	
3	22.91	157.52	10.55	10.71	10.48	6.67	6.89	16.67		10.72	10.72	10.84	74.23	
4	50.05	207.57	10.61	12.27	10.50	6.08	6.90	17.65		10.74	10.70	2.12	29.50	
5	38.57	247.14	10.66	11.35	9.74	6.84	7.10	17.32		10.97	10.07	8.23	38.15	
6	56.26	303.40	10.67	13.70	10.65	7.00	7.20	20.26		11.18	10.80	10.79	39.14	
7	51.81	355.21	10.96	2.45	10.42	7.12	7.46	11.89		11.30	9.67	21.17	55.13	
8	47.42	402.63	10.89	4.03	10.75	7.23	7.64	12.68		11.42	10.24	10.73	24.60	
9	43.27	445.90	11.07	3.19	10.67	7.70	7.82	14.69		11.58	11.58	8.90	25.59	
10	52.57	498.47	11.12	5.54	10.92	7.26	8.35	18.68		11.67	11.33	0.99	18.87	
												3.75	27.97	

Table 3.8(1/2) COORDINATES OF CROSS SECTION POINT - WEST FLOODWAY/GARANG RIVER

STATION	NORTHING	EASTING	ELEVATION	DISTANCE	ACCUM DIS	STATION	NORTHING	EASTING	ELEVATION	DISTANCE	ACCUM DIS
WF 0L	9232169.780	432894.394	0.765	0.00	0.00						
WF 0L	9232158.066	432901.499	0.747	13.70	13.70						
WF 1L	9232115.138	432926.953	0.611	49.91	63.61						
WF 2L	9232074.061	432951.733	0.965	47.97	111.58						
WF 3L	9232027.812	432979.706	0.829	54.66	165.63						
WF 4L	9231985.758	433004.490	0.892	47.96	213.59						
WF 5L	9231943.797	433030.119	0.969	50.02	263.61						
WF 6L	9231900.990	433055.925	1.164	49.98	313.59						
WF 7L	9231858.601	433082.465	0.442	50.01	363.61						
WF 8L	9231815.646	433108.376	0.462	49.99	413.60	WF 0R	9231907.759	433291.856	0.214	0.00	0.00
WF 9L	9231773.085	433134.135	0.475	49.92	463.52	WF 1R	9231859.923	433293.931	0.778	47.68	47.68
WF 10L	9231729.761	433159.760	0.413	50.33	513.85	WF 2R	9231823.179	433313.404	0.294	41.58	89.47
WF 11L	9231689.004	433192.834	0.692	52.43	566.34	WF 3R	9231774.871	433332.644	0.696	52.00	141.45
WF 12L	9231646.605	433217.404	1.046	49.01	615.35	WF 4R	9231720.612	433352.893	0.688	57.91	199.38
WF 13L	9231597.273	433245.801	1.157	56.92	672.27	WF 5R	9231662.905	433381.815	0.830	64.55	263.93
WF 14L	9231555.016	433264.350	1.267	46.15	718.42	WF 6R	9231600.276	433376.999	1.652	62.81	326.74
WF 15L	9231512.402	433282.977	1.150	46.51	764.92	WF 7R	9231559.956	433394.364	1.933	43.90	370.64
WF 16L	9231467.334	433304.101	1.128	49.77	814.70	WF 8R	9231511.478	433416.047	2.267	53.11	423.75
WF 17L	9231423.067	433327.455	1.052	50.05	864.75	WF 9R	9231471.635	433435.061	2.275	44.15	467.90
WF 18L	9231377.213	433347.574	0.662	50.07	914.82	WF 10R	9231427.965	433461.435	2.565	51.02	518.91
WF 19L	9231332.093	433368.951	0.459	49.93	964.75	WF 11R	9231388.974	433455.755	2.135	45.98	564.89
WF 20L	9231285.520	433388.883	0.208	49.74	1014.49	WF 12R	9231355.193	433530.922	0.709	56.37	621.26
WF 21L	9231240.914	433409.396	1.784	50.01	1064.50	WF 13R	9231303.505	433545.565	1.249	53.72	674.98
WF 22L	9231195.017	433429.741	1.399	50.20	1114.70	WF 14R	9231267.500	433561.255	1.541	39.28	714.25
WF 23L	9231152.785	433459.230	0.409	51.51	1166.21	WF 15R	9231206.293	433589.024	0.340	67.21	781.47
WF 24L	9231106.938	433478.304	0.048	49.66	1215.87	WF 16R	9231151.723	433620.576	0.630	63.04	844.50
WF 25L	9231060.339	433495.584	0.307	49.84	1265.71	WF 17R	9231110.977	433632.417	0.933	42.43	886.93
WF 26L	9231012.435	433510.555	0.852	50.07	1315.78	WF 18R	9231062.464	433646.692	1.042	50.57	937.50
WF 27L	9230967.154	433534.263	0.236	60.15	1375.93	WF 19R	9231002.847	433664.649	1.064	62.26	999.76
WF 28L	9230916.892	433551.171	1.274	40.85	1416.78	WF 20R	9230953.067	433680.526	1.041	52.25	1052.02
WF 29L	9230868.472	433551.859	1.322	49.59	1466.37	WF 21R	9230901.801	433698.221	1.191	54.23	1106.25
WF 30L	9230819.359	433561.056	1.930	49.97	1516.34	WF 22R	9230852.244	433715.786	1.327	52.58	1158.83
WF 31L	9230770.257	433571.042	1.184	50.10	1566.44	WF 23R	9230803.154	433731.352	1.121	51.50	1210.33
WF 32L	9230721.207	433580.955	1.253	50.04	1616.48	WF 24R	9230762.355	433745.143	1.435	43.07	1253.39
WF 33L	9230672.770	433594.503	1.261	50.30	1666.78	WF 25R	9230724.870	433757.282	1.443	39.43	1292.83
WF 34L	9230625.403	433610.161	1.113	49.89	1716.68	WF 26R	9230677.241	433770.657	1.204	49.44	1342.27
WF 35L	9230578.492	433624.282	1.163	48.99	1765.65	WF 27R	9230621.738	433786.835	1.506	57.81	1400.08
WF 36L	9230528.461	433637.434	0.999	51.73	1817.38	WF 28R	9230569.362	433803.228	1.402	54.68	1454.96
WF 37L	9230480.870	433651.284	1.354	49.57	1866.95	WF 29R	9230514.423	433811.021	1.484	55.49	1510.45
WF 38L	9230431.583	433658.513	0.608	49.81	1916.76	WF 30R	9230460.330	433821.259	1.070	55.05	1565.51
WF 39L	9230377.760	433662.183	0.769	53.55	1970.31	WF 31R	9230405.099	433830.733	1.017	55.04	1621.54
WF 40L	9230331.589	433665.974	0.880	46.33	2017.04	WF 32R	9230348.248	433849.902	1.928	60.00	1681.54
WF 41L	9230281.638	433669.033	1.227	50.04	2067.08	WF 33R	9230291.301	433849.444	1.221	56.95	1738.49
WF 42L	9230231.576	433671.454	1.935	50.12	2117.20	WF 34R	9230233.169	433856.449	1.322	58.55	1797.04
WF 43L	9230181.702	433675.803	1.427	50.06	2167.27	WF 35R	9230195.552	433860.904	1.324	37.83	1834.92
WF 44L	9230131.625	433679.044	0.968	50.18	2217.45	WF 36R	9230157.472	433861.705	1.545	38.09	1873.01
WF 45L	9230081.953	433682.812	1.118	49.81	2267.26	WF 37R	9230109.515	433869.452	1.503	48.58	1921.59
WF 46L	9230032.044	433685.872	1.371	50.00	2317.26	WF 38R	9230061.999	433876.133	2.152	47.98	1969.57
WF 47L	9229982.213	433689.810	1.093	49.99	2367.25	WF 39R	9230002.017	433879.699	1.220	60.09	2029.66
WF 48L	9229932.472	433694.915	1.060	50.00	2417.25	WF 40R	9229961.488	433883.501	1.126	40.70	2070.36
WF 49L	9229883.125	433702.451	1.231	49.92	2467.17	WF 41R	9229904.295	433876.713	0.374	57.60	2127.96
WF 50L	9229833.820	433711.791	0.930	50.18	2517.35	WF 42R	9229852.847	433885.940	1.189	52.27	2180.23
WF 51L	9229784.375	433718.618	1.226	49.91	2567.27	WF 43R	9229806.828	433887.558	0.695	45.05	2226.28
WF 52L	9229735.389	433728.165	1.203	49.91	2617.18	WF 44R	9229755.591	433889.164	1.107	51.25	2277.54
WF 53L	9229685.882	433736.089	1.241	50.14	2667.31	WF 45R	9229699.913	433882.931	0.313	56.03	2333.56
WF 54L	9229636.385	433742.389	1.523	49.92	2717.23	WF 46R	9229647.800	433880.737	0.936	52.69	2386.26
WF 55L	9229586.624	433748.687	1.646	50.14	2767.37	WF 47R	9229593.612	433892.551	0.902	44.23	2430.49
WF 56L	9229537.068	433755.078	2.282	49.97	2817.33	WF 48R	9229550.709	433897.489	2.621	53.13	2483.62
WF 57L	9229487.475	433761.350	2.098	49.99	2867.32	WF 49R	9229497.081	433898.411	1.651	53.64	2537.25
WF 58L	9229438.130	433768.858	2.028	49.92	2917.24	WF 50R	9229449.531	433899.152	1.274	47.56	2584.81
WF 59L	9229388.364	433774.740	2.273	50.11	2967.35	WF 51R	9229403.240	433901.582	1.595	46.35	2631.18
WF 60L	9229338.832	433780.563	2.197	49.87	3017.22	WF 52R	9229354.317	433902.621	2.322	48.93	2680.10
WF 61L	9229289.110	433786.398	2.328	50.06	3067.28	WF 53R	9229300.283	433904.461	2.545	54.07	2734.16
WF 62L	9229239.436	433791.772	1.813	49.96	3117.25	WF 54R	9229245.278	433904.497	1.336	55.00	2789.17
WF 63L	9229189.911	433798.837	1.382	50.03	3167.27	WF 55R	9229198.571	433906.081	2.163	46.73	2835.90
WF 64L	9229140.055	433803.343	1.993	50.05	3217.32	WF 56R	9229148.164	433909.011	2.329	50.49	2886.39
WF 65L	9229090.445	433810.098	2.250	50.08	3267.40	WF 57R	9229097.242	433904.326	1.414	51.14	2937.53
WF 66L	9229040.839	433817.653	2.227	50.18	3317.58	WF 58R	9229044.035	433913.136	2.376	53.93	2991.46
WF 67L	9228991.332	433824.965	2.568	50.04	3367.62	WF 59R	9228999.490	433914.047	2.626	44.55	3036.02
WF 68L	9228942.315	433827.275	2.668	49.07	3417.70	WF 60R	9228947.972	433914.695	2.237	51.53	3087.54
WF 69L	9228891.644	433833.565	2.757	51.06	3467.76	WF 61R	9228893.107	433919.855	2.041	55.07	3142.62
WF 70L	9228841.837	433837.015	2.707	49.93	3517.68	WF 62R	9228845.212	433922.004	2.289	47.55	3190.57
WF 71L	9228791.716	433840.511	3.153	50.24	3567.92	WF 63R	9228800.231	433926.630	2.452	45.22	3235.78
WF 72L	9228742.006	433847.326	1.870	50.18	3618.10	WF 64R	9228746.918	433931.960	3.200	53.58	3289.36
WF 73L	9228691.960	433854.581	4.592	50.05	3668.15	WF 65R	9228698.437	433944.467	4.625	50.07	3339.43
WF 74L	9228640.869	433852.543	4.363	51.44	3719.59	WF 66R	9228643.193	433939.062	3.553	50.53	3389.96
WF 75L	9228590.396	433856.134	4.368	50.60	3770.19	WF 67R	9228594.031	433940.931	3.938	54.20	3444.16
WF 76L	9228542.572	433860.047	4.656	47.98	3818.17	WF 68R	9228548.066	433942.961	4.207	46.02	3490.18
WF 77L	9228492.656	433868.249	4.567	50.30	3868.47	WF 69R	9228500.562	433952.868	3.562	48.52	3538.70
WF 78L	9228442.951	433871.523	4.994	49.98	3918.46	WF 70R	9228450.046	433962.200	3.742	51.38	3590.08
WF 79L	9228391.680	433875.042	4.733	51.39	3969.85	WF 71R	9228399.221	433960.452	3.260	50.86	3640.93
WF 72+22L	9228318.747	433899.846	77.04	4046.83	77.04	WF 72+22R	9228303.423	433962.339	2.156	95.82	3736.75
WF 72L	9228342.941	433927.834	2.166	27.01	4073.90	WF 72R	9228337.836	433961.357	2.501	34.43	3771.18
WF 73+33L	9228258.025	433937.590	5.244	84.92	4158.81	WF 73+33R	9228265.746	433973.460	5.098	73.10	

Table 3.8(2/2) COORDINATES OF CROSS SECTION POINT - WEST FLOODWAY/GARANG RIVER

STATION	NORTHING	EASTING	ELEVATION	DISTANCE	ACCUMULIS	STATION	NORTHING	EASTING	ELEVATION	DISTANCE	ACCUMULIS
WF 90L	9227443.775	433956.295	5.707	50.07	5044.75	WF 90R	9227447.129	434039.912	5.924	50.62	4765.01
WF 91L	9227333.548	433567.062	5.520	50.23	5094.98	WF 91R	9227390.783	434048.027	5.354	56.93	4761.94
WF 92L	9227343.699	433965.134	5.782	49.89	5144.87	WF 92R	9227340.082	434034.489	6.308	50.82	4812.79
WF 93L	9227293.738	433955.032	5.772	49.96	5194.83	WF 93R	9227292.959	434045.273	6.626	47.13	4859.89
WF 94+23L	9227270.568	433965.258	3.650	73.88	5268.71	WF 94+23R	9227217.118	434034.987	3.871	76.64	4936.43
WF 94L	9227343.884	433955.815	8.952	25.16	5293.87	WF 94R	9227245.835	434040.306	5.597	30.19	4966.62
WF 95L	9227194.698	433947.106	6.178	49.95	5343.82	WF 95R	9227191.477	434040.413	6.697	55.36	5021.98
WF 96L	9227144.917	433945.111	6.343	49.82	5393.64	WF 96R	9227147.831	434043.694	7.056	43.72	5065.70
WF 97L	9227094.991	433943.724	6.736	49.95	5443.59	WF 97R	9227090.648	434042.924	7.551	51.24	5116.94
WF 98L	9227045.034	433943.004	6.744	49.96	5493.58	WF 98R	9227042.774	434043.451	8.092	53.88	5170.81
WF 99L	9226994.991	433942.268	7.504	50.05	5543.60	WF 99R	9226992.027	434044.036	8.837	50.75	5221.56
WF 99+30R	9226965.233	433944.660		29.84	5573.43	WF 99+30R	9226964.124	434037.655		28.62	5250.18
WF 100L	9226934.289	433949.563	8.634	20.56	5593.99	WF 100R	9226939.702	434036.468	8.802	24.45	5274.63
WF 101L	9226895.318	433950.427	9.442	49.96	5643.95	WF 101R	9226890.365	434027.203	7.180	50.20	5324.83
WF 102L	9226845.352	433948.253	9.309	50.01	5693.96	WF 102R	9226832.377	434023.855	7.579	58.08	5382.92
WF 103L	9226795.694	433942.422	9.638	50.00	5743.96	WF 103R	9226719.918	434027.480	7.606	52.58	5435.50
WF 104L	9226747.292	433929.819	9.160	50.02	5793.98	WF 104R	9226719.692	433997.371	7.920	67.33	5502.83
WF 105L	9226690.959	433910.969	9.279	50.02	5844.00	WF 105R	9226673.402	433975.772	8.053	51.08	5553.92
WF 106L	9226645.538	433892.355	9.176	50.01	5894.01	WF 106R	9226632.468	433957.445	9.079	44.65	5598.77
WF 107L	9226599.241	433870.899	9.711	50.12	5944.13	WF 107R	9226583.362	433935.177	7.604	53.92	5652.68
WF 108L	9226558.950	433857.251	11.033	52.11	5994.24	WF 108R	9226528.314	433925.459	11.893	55.90	5708.58
WF 109L	9226516.185	433835.840	13.222	47.83	6044.07	WF 109R	9226492.787	433910.209	12.509	38.68	5747.25
WF 110L	9226465.084	433839.899	14.000	51.34	6095.41	WF 110R	9226445.572	433895.695	12.604	43.40	5796.64
WF 111L	9226422.468	433812.911	11.854	50.33	6145.79	WF 111R	9226399.590	433883.906	10.427	47.47	5844.11
WF 112L	9226380.574	433787.122	10.431	33.83	6197.62	WF 112R	9226363.460	433878.550	9.972	36.52	5880.63
WF 113L	9226331.291	433772.646	10.500	32.67	6212.28	WF 113R	9226314.127	433866.430	9.473	49.96	5930.59
WF 114L	9226284.152	433751.309	10.275	32.97	6245.26	WF 114R	9226269.446	433909.510	9.447	50.29	5980.83
WF 115L	9226239.473	433723.400	10.663	32.51	6277.77	WF 115R	9226225.323	433931.643	7.739	43.36	6030.25
WF 116L	9226193.127	433706.203	10.743	34.01	6311.78	WF 116R	9226175.350	433936.826	10.811	50.24	6080.49
WF 117L	9226272.141	433688.828	10.896	32.94	6344.72	WF 117R	9226131.001	433914.010	11.009	49.87	6130.36
WF 118L	9226247.861	433677.072	10.797	26.98	6371.70	WF 118R	9226093.800	433879.503	9.201	50.47	6180.83
WF 119L	9226224.272	433664.014	10.879	26.96	6398.66	WF 119R	9226055.795	433849.531	9.721	48.65	6229.48
WF 120L	9226200.718	433650.883	11.122	26.97	6425.63	WF 120R	9226015.528	433820.669	11.046	49.54	6279.03
WF 121L	9226176.849	433638.721	11.096	27.02	6452.65	WF 121R	9225975.401	433790.725	10.826	50.07	6329.09
WF 122L	9226153.253	433624.600	11.263	27.25	6479.89	WF 122R	9225934.413	433752.100	11.159	49.52	6378.51
WF 123L	9226129.614	433612.153	11.264	26.72	6506.61	WF 123R	9225890.138	433702.533	11.333	49.90	6428.51
WF 124L	9226106.040	433599.326	11.202	26.84	6533.45	WF 124R	9225863.709	433654.434	11.253	43.98	6478.49
WF 125L	9226085.199	433582.522	11.379	26.77	6560.22	WF 125R	9225974.151	433606.475	11.203	49.08	6527.57
WF 126L	9226049.664	433539.931	11.092	55.34	6615.56	WF 126R	9225990.643	433568.089	11.344	50.24	6577.81
WF 127L	9226037.603	433491.518	11.018	49.94	6665.50	WF 127R	9225929.193	433516.164	11.008	51.93	6629.74
WF 128L	9226024.929	433443.172	11.140	49.98	6715.48	WF 128R	9225900.257	433498.914	10.889	34.00	6663.73
WF 129L	9226005.091	433397.479	11.223	49.81	6765.29	WF 129R	9225873.351	433483.732	11.120	30.89	6694.63
WF 130L	9225981.446	433380.744	10.450	49.81	6815.11	WF 130R	9225855.354	433478.656	11.209	9.46	6704.08
WF 131L	9225958.804	433322.716	10.684	50.12	6865.22	WF 131R	9225828.304	433458.240	11.543	42.32	6748.40
WF 132L	9225934.348	433268.442	10.592	50.03	6915.25	WF 132R	9225819.145	433451.223	11.598	11.54	6797.94
WF 133L	9225910.150	433257.910	11.589	49.93	7014.05	WF 133R	9225814.563	433413.787	8.710	37.72	6795.65
WF 134L	9225892.268	433242.662	11.763	50.26	7064.30	WF 134R	9225783.911	433398.651	11.232	34.19	6829.84
WF 135L	9225875.615	433208.666	12.589	49.99	7114.29	WF 135R	9225712.379	433333.566	11.396	96.72	6926.56
WF 137L	9225859.570	433170.229	13.351	50.04	7164.34	WF 137R	9225650.800	433305.109	9.903	67.83	6994.39
WF 138L	9225844.773	433129.818	13.576	49.82	7213.96	WF 138R	9225509.765	433296.421	11.686	141.30	7135.69
WF 139L	9225823.040	433099.117	12.231	51.81	7265.77	WF 139R	9225401.682	433289.165	12.845	108.33	7244.02
WF 140L	9225806.343	433048.607	13.213	53.20	7318.97	WF 140R	9225354.975	433233.692	8.533	72.53	7316.55
WF 141L	9225812.999	433010.668	12.527	50.51	7369.43	WF 141R	9225315.852	433174.392	9.560	71.04	7387.60
WF 142L	9225853.179	432961.797	11.730	49.85	7419.32	WF 142R	9225259.922	433094.676	12.399	91.09	7478.68
WF 143L	9225858.093	432911.513	10.144	50.37	7469.69	WF 143R	9225447.430	432993.209	12.767	137.04	7615.73
WF 144L	9225890.055	432863.431	11.310	50.03	7519.72	WF 144R	9225479.549	432897.636	13.089	97.04	7712.77
WF 145L	9225862.176	432818.926	11.409	49.73	7569.45	WF 145R	9225426.731	432837.600	12.983	62.45	7775.22
WF 146L	9225896.673	432768.095	10.129	51.13	7620.58	WF 146R	9225501.048	432792.167	13.367	45.64	7820.85
WF 147L	9225891.469	432720.254	10.381	48.12	7668.70	WF 147R	9225500.098	432770.921	13.410	21.27	7842.12
WF 148L	9225893.188	432670.552	12.112	49.73	7718.43	WF 148R	9225505.157	432733.888	13.163	37.38	7879.50
WF 149L	9225887.550	432620.423	10.940	50.44	7768.87	WF 149R	9225509.533	432683.164	13.537	50.91	7930.41
WF 150L	9225885.447	432570.587	11.190	49.89	7818.75	WF 150R	9225511.246	432617.394	13.474	65.79	7996.20
WF 151L	9225867.722	432529.613	10.415	49.47	7868.23	WF 151R	9225506.446	432584.507	11.184	33.23	8029.44
WF 152L	9225890.528	432502.078	11.319	38.70	7906.93	WF 152R	9225493.524	432572.394	13.409	17.71	8047.15
WF 153L	9225491.820	432471.820	11.660	49.13	7956.06	WF 153R	9225479.956	432565.567	13.388	15.01	8062.16
WF 154L	9225434.664	432477.820	8.570	57.47	8013.53	WF 154R	9225457.230	432542.154	13.477	32.92	8095.09
WF 155L	9225385.983	432461.352	8.655	51.39	8064.92	WF 155R	9225423.407	432525.404	13.604	37.74	8132.82
WF 156L	9225342.449	432443.169	8.906	46.66	8111.87	WF 156R	9225371.671	432518.708	13.831	52.46	8185.29
WF 157L	9225297.674	432411.266	8.971	55.33	8167.20	WF 157R	9225309.860	432506.024	13.960	62.73	8248.01
WF 158L	9225255.270	432381.234	9.124	51.96	8219.16	WF 158R	9225260.972	432476.855	14.137	58.93	8304.94
WF 159L	9225212.422	432360.570	9.650	47.57	8266.73	WF 159R	9225218.698	432452.583	14.165	43.63	8353.57
WF 160L	9225184.235	432336.425	9.321	53.90	8320.63	WF 160R	9225174.080	432431.150	14.337	49.59	8403.16
WF 161L	9225131.772	432315.528	11.042	33.61	8359.23	WF 161R	9225113.825	432406.066	14.482	65.29	8469.45
WF 162L	9225087.655	432280.670	14.569	56.23	8415.46	WF 162R	9225092.254	432392.577	14.240	25.41	8493.66
WF 163L	9225038.614	432265.975	9.910	51.19	8466.66	WF 163R	9225040.565	432368.008	14.354	57.23	8551.09
WF 164L	9225000.911	432246.728	10.065	42.33	8508.99	WF 164R	9224991.898	432345.090	14.523	53.80	8604.69
WF 165L	9224952.333	432234.662	10.174	50.05	8559.04	WF 165R	9224960.304	432333.179	14.301	33.76	8638.65
WF 166L	9224911.142	432227.430	11.504	41.82	8600.66	WF 166R	9224934.337	432318.566	14.266	23.80	8668.45
WF 167L	9224885.671	432248.469	10.597	50.10	8650.97	WF 167R	9224928.254	432318.146	14.246	6.10	8674.55



Table 3.9 COORDINATES OF CROSS SECTION POINT - CENGKEK RIVER

STATION	NORTHING	EASTING	ELEVATION	STATION	NORTHING	EASTING	ELEVATION	ACCUM. DIS	STATION	NORTHING	EASTING	ELEVATION	DISTANCE
CE.0L	9225944.110	433421.945	7.00	CEC-0	9225955.386	433423.177	0.00	0.00	CE.0R	9225966.662	433424.409	6.33	22.69
CE.0-28L	9225940.280	433449.460	6.13	CEC-0-28	9225942.297	433455.382	34.76	34.76	CE.0-28R	9225944.313	433461.304	8.49	12.51
CE.1L	9225919.372	433442.184	7.28	CEC-1	9225917.590	433451.455	25.02	59.78	CE.1R	9225915.808	433460.726	8.18	18.88
CE.2L	9225970.719	433430.669	7.53	CEC-2	9225969.792	433436.592	50.07	109.85	CE.2R	9225968.845	433442.495	6.90	11.97
CE.3L	9225920.951	433426.515	8.49	CEC-3	9225921.676	433439.490	48.19	158.04	CE.3R	9225922.402	433452.345	11.56	25.87
CE.4L	9225767.238	433438.304	8.87	CEC-4	9225770.758	433448.044	51.35	209.38	CE.4R	9225774.278	433453.783	10.72	17.00
CE.5L	9225725.058	433450.524	9.16	CEC-5	9225728.285	433459.667	44.60	253.99	CE.5R	9225731.513	433468.810	19.39	19.39
CE.6L	9225685.098	433479.339	8.55	CEC-6	9225689.590	433483.118	45.26	299.24	CE.6R	9225694.063	433466.898	8.25	11.73
CE.7L	9225657.461	433521.967	8.55	CEC-7	9225662.556	433525.395	50.18	349.42	CE.7R	9225667.651	433528.822	9.52	12.28
CE.8L	9225629.609	433557.367	10.31	CEC-8	9225633.200	433565.747	49.90	399.32	CE.8R	9225637.791	433574.127	10.78	19.11
CE.9L	9225579.645	433569.685	10.49	CEC-9	9225581.798	433578.370	52.99	452.31	CE.9R	9225583.831	433587.076	10.37	17.91
CE.10L	9225537.985	433596.944	10.99	CEC-10	9225541.243	433602.754	47.27	499.58	CE.10R	9225544.502	433608.564	10.99	13.32

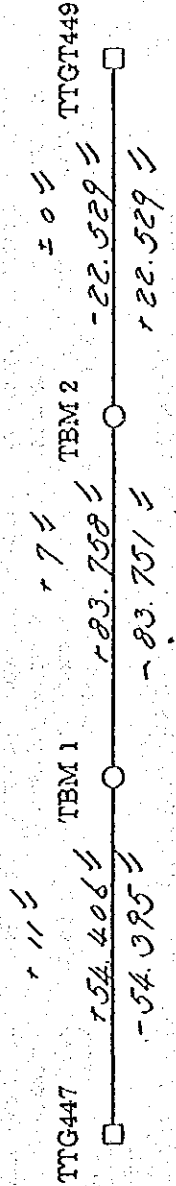
Table 3.10 COORDINATES OF CROSS SECTION POINT - KALITO RIVER

STATION	NORTHING	EASTING	ELEVATION	STATION	NORTHING	EASTING	DISTANCE	ACCUM. DIS	STATION	NORTHING	EASTING	ELEVATION	DISTANCE
KA.0L	9225369.666	433261.824	7.95	KAC-0	9225374.777	433270.312	0.00	0.00	KA.0R	9225379.888	433279.000	12.52	20.16
KA.1L	9225323.472	433248.979	9.76	KAC-1	9225317.909	433260.899	57.64	57.64	KA.1R	9225312.346	433272.919	9.22	26.49
KA.2L	9225278.131	433227.837	10.18	KAC-2	9225273.130	433238.736	49.96	107.61	KA.2R	9225269.130	433248.634	23.98	23.98
KA.3L	9225230.858	433211.194	10.55	KAC-3	9225227.386	433218.771	49.91	157.52	KA.3R	9225223.913	433226.349	10.84	18.67
KA.4L	9225186.178	433198.748	10.61	KAC-4	9225182.440	433196.743	50.05	207.57	KA.4R	9225178.701	433204.738	10.51	17.65
KA.5L	9225138.537	433189.190	10.66	KAC-5	9225142.885	433195.680	39.57	247.14	KA.5R	9225147.233	433203.169	10.61	17.32
KA.6L	9225092.447	433204.709	10.67	KAC-6	9225089.868	433214.507	56.26	303.40	KA.6R	9225087.288	433224.306	10.79	20.26
KA.7L	9225054.973	433172.154	10.99	KAC-7	9225053.256	433177.845	51.81	355.21	KA.7R	9225051.539	433183.586	10.73	11.89
KA.8L	9225007.998	433156.633	10.89	KAC-8	9225008.239	433162.956	47.42	402.63	KA.8R	9225008.480	433169.260	10.89	12.66
KA.9L	9224967.295	433181.945	11.07	KAC-9	9224972.266	433187.034	43.27	445.90	KA.9R	9224977.277	433192.422	11.15	14.69
KA.10L	9224922.285	433200.877	11.12	KAC-10	9224924.917	433209.837	52.57	498.47	KA.10R	9224927.546	433218.797	11.33	18.68

Table 3.11

CHECK LEVELING (FROM TTG447 TO TTG449)

CHECK LEVELING (FROM TTG447 TO TTG449)



Distance  
 I 0.695 ✓  
 II 0.698 ✓  
 -----  
 1.393 ✓

I 0.484 ✓  
 II 0.483 ✓  
 -----  
 0.967 ✓

I 1.103 ✓  
 II 1.138 ✓  
 -----  
 2.241 ✓

TOTAL 4.601 km ✓

TTG 449 220.627 ✓

TTG 447 104.987 ✓

Difference +115.640 ✓

Survey +115.626 ✓

-----  
 + 14 ✓ (± 21) ✓