JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA

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

FINAL REPORT

COMPONENT B: JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

VOLUME VIII ANNEX

AUGUST 2000

CTI ENGINEERING INTERNATIONAL CO., LTD.
IN ASSOCIATION WITH
PACIFIC CONSULTANTS INTERNATIONAL
AND
PASCO INTERNATIONAL INC.

1159983 (4)

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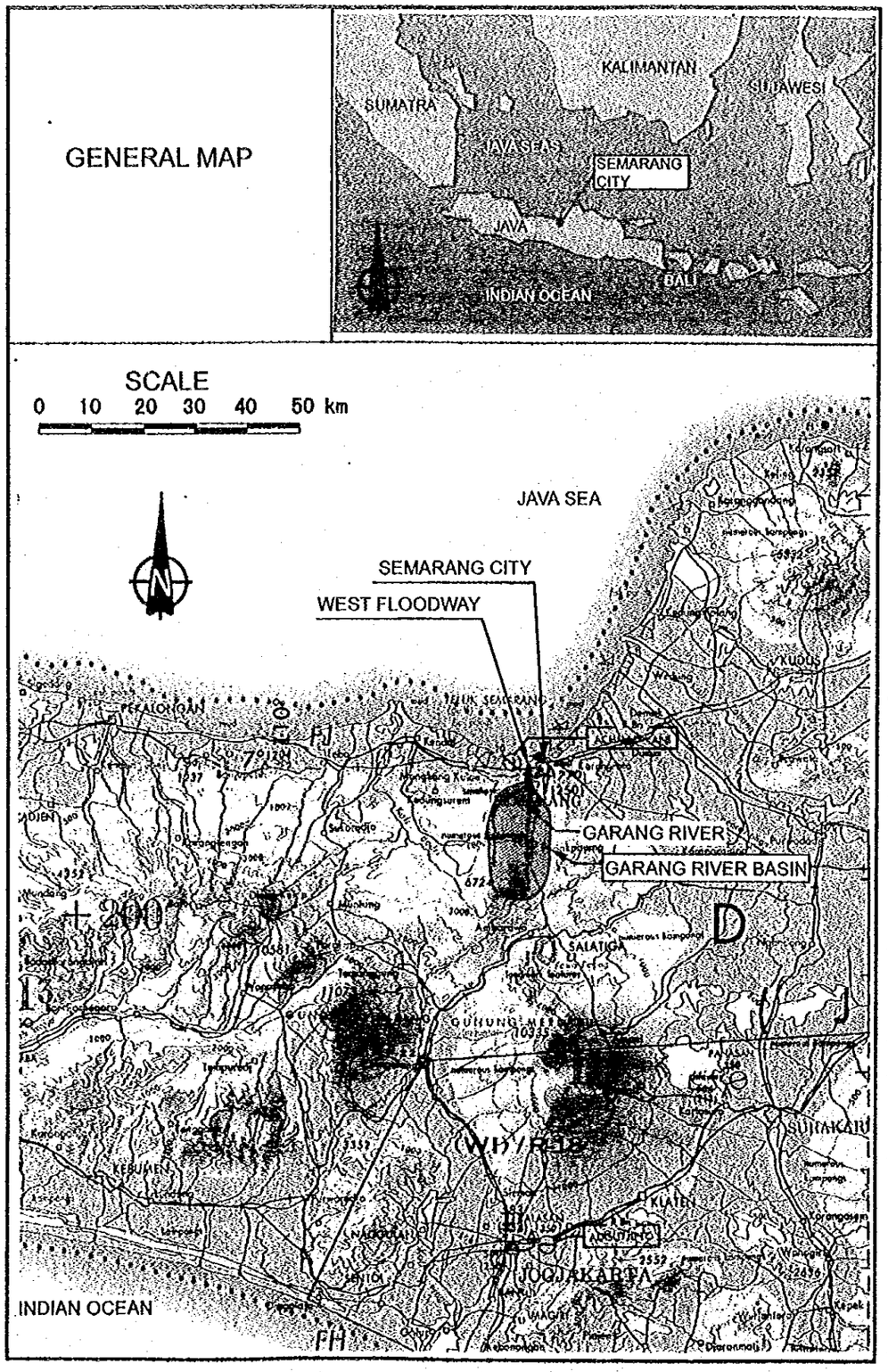
GENERAL MAP
KALIMANTAN
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SUMATRA
JAVA SEA
SEMARANG CITY
JAVA
BALI
INDIAN OCEAN
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0 10 20 30 40 50 km
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GARANG RIVER BASIN
SALATIGA
KUDUS
PEKALONGAN
KEBUMEN
SURAKARTA
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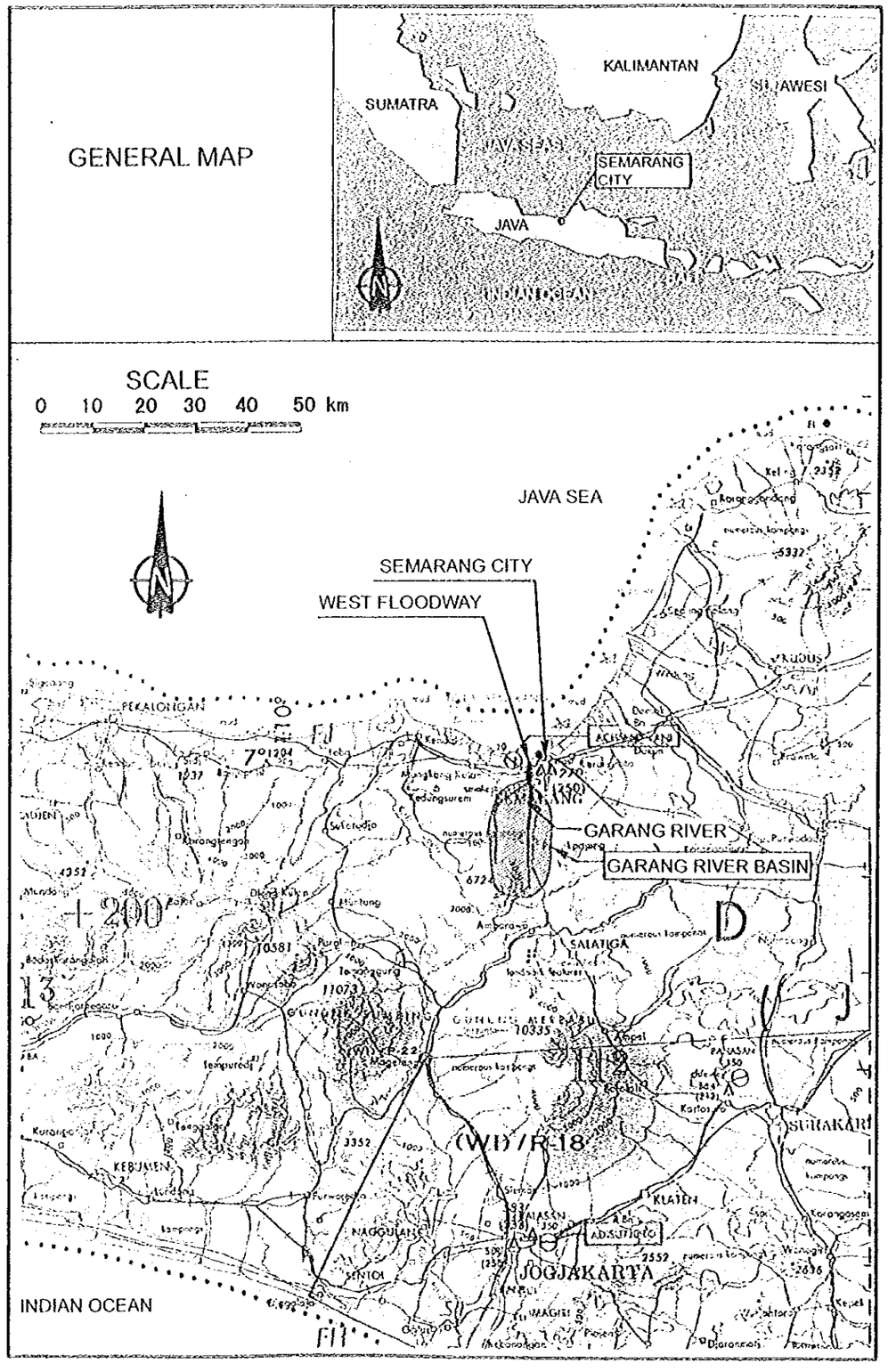
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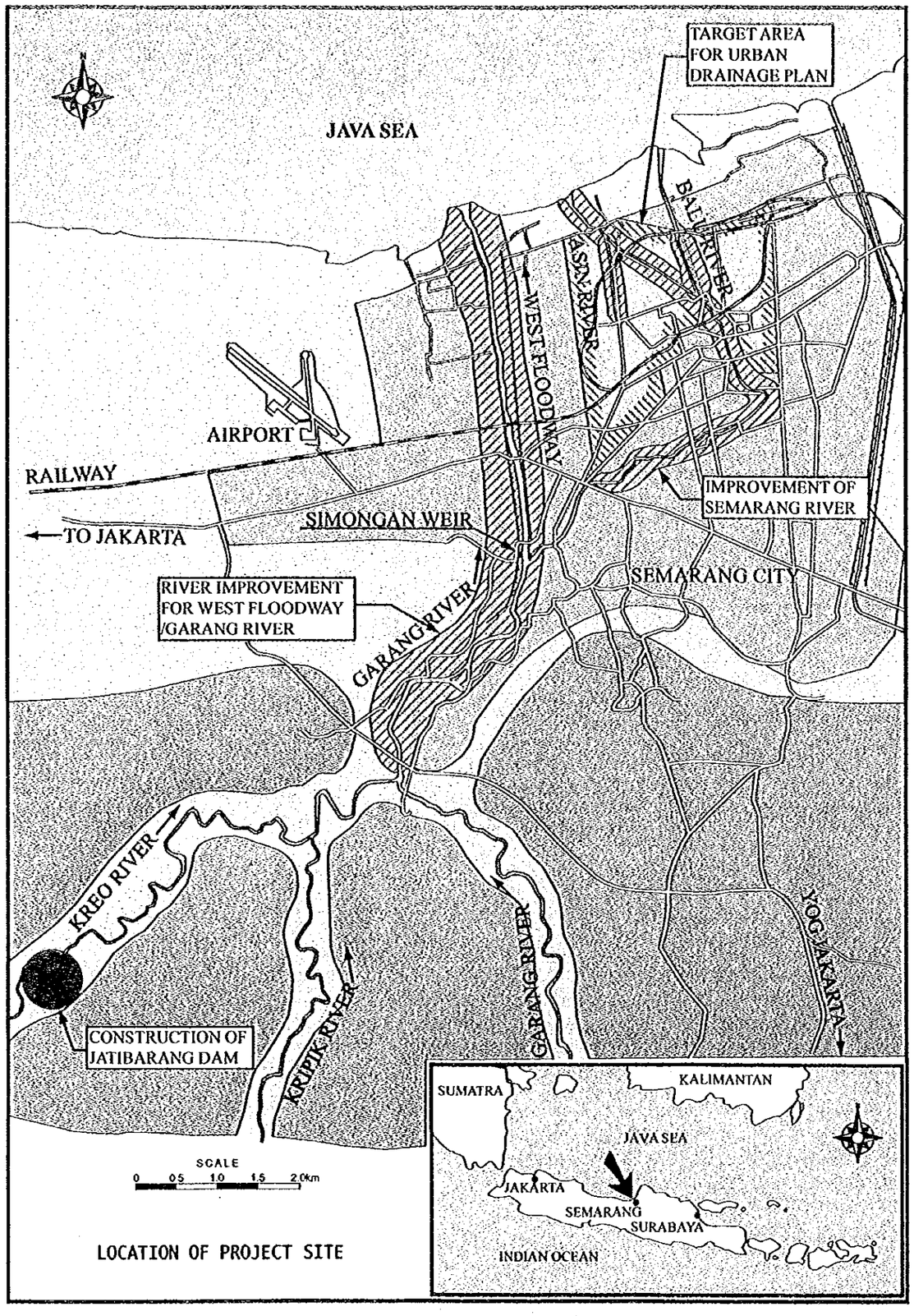
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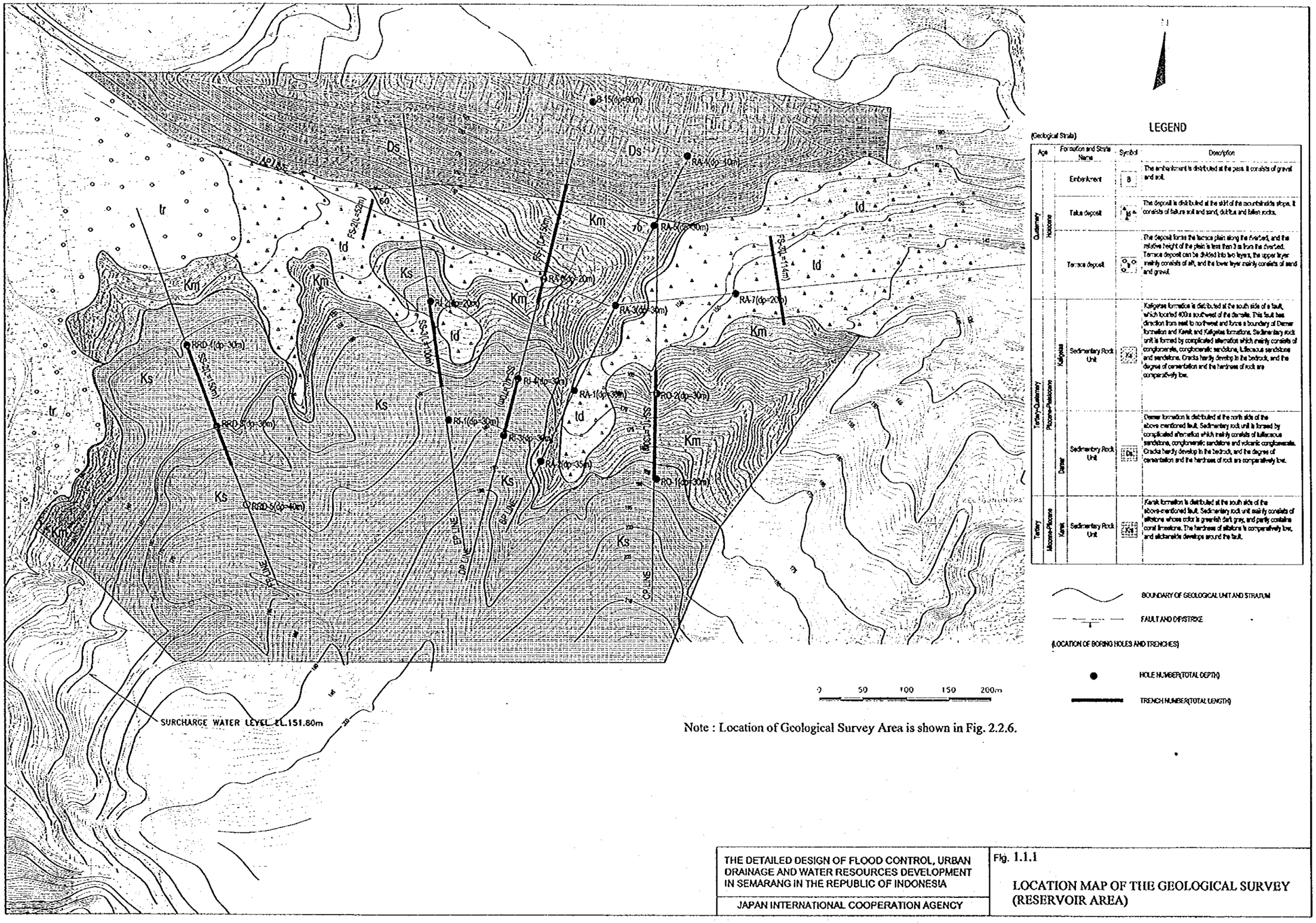


LEGEND

(Geological Strata)

Age		Formation and Strata Name	Symbol	Description
Quaternary	Holocene	Embankment	B	The embankment is distributed at the pass. It consists of gravel and soil.
		Talus deposit	td	The deposit is distributed at the skirt of the mountainside slope. It consists of failure soil and sand, detritus and fallen rocks.
		Terrace deposit	tr	The deposit forms the terrace plain along the river bed, and the relative height of the plain is less than 3 m from the river bed. Terrace deposit can be divided into two layers, the upper layer mainly consists of silt, and the lower layer mainly consists of sand and gravel.
Tertiary-Quaternary	Pliocene-Pleistocene	Kaligetas — Sedimentary Rock Unit	Ks	Kaligetas formation is distributed at the south side of a fault, which located 400m southwest of the damsite. This fault has direction from east to northwest and forms a boundary of Damar formation and Karak and Kaligetas formations. Sedimentary rock unit is formed by complicated alternation which mainly consists of conglomerate, conglomeratic sandstone, tuffaceous sandstone and sandstone. Cracks hardly develop in the bedrock, and the degree of cementation and the hardness of rock are comparatively low.
		Damar — Sedimentary Rock Unit	Dr	Damar formation is distributed at the north side of the above-mentioned fault. Sedimentary rock unit is formed by complicated alternation which mainly consists of tuffaceous sandstone, conglomeratic sandstone and volcanic conglomerate. Cracks hardly develop in the bedrock, and the degree of cementation and the hardness of rock are comparatively low.
Tertiary	Miocene-Pliocene	Karak — Sedimentary Rock Unit	Km	Karak formation is distributed at the south side of the above-mentioned fault. Sedimentary rock unit mainly consists of siltstone whose color is greenish dark gray, and partly contains coral limestone. The hardness of siltstone is comparatively low, and alchanalite develops around the fault.

BOUNDARY OF GEOLOGICAL UNIT AND STRATUM

FAULT AND DIP/STRIKE

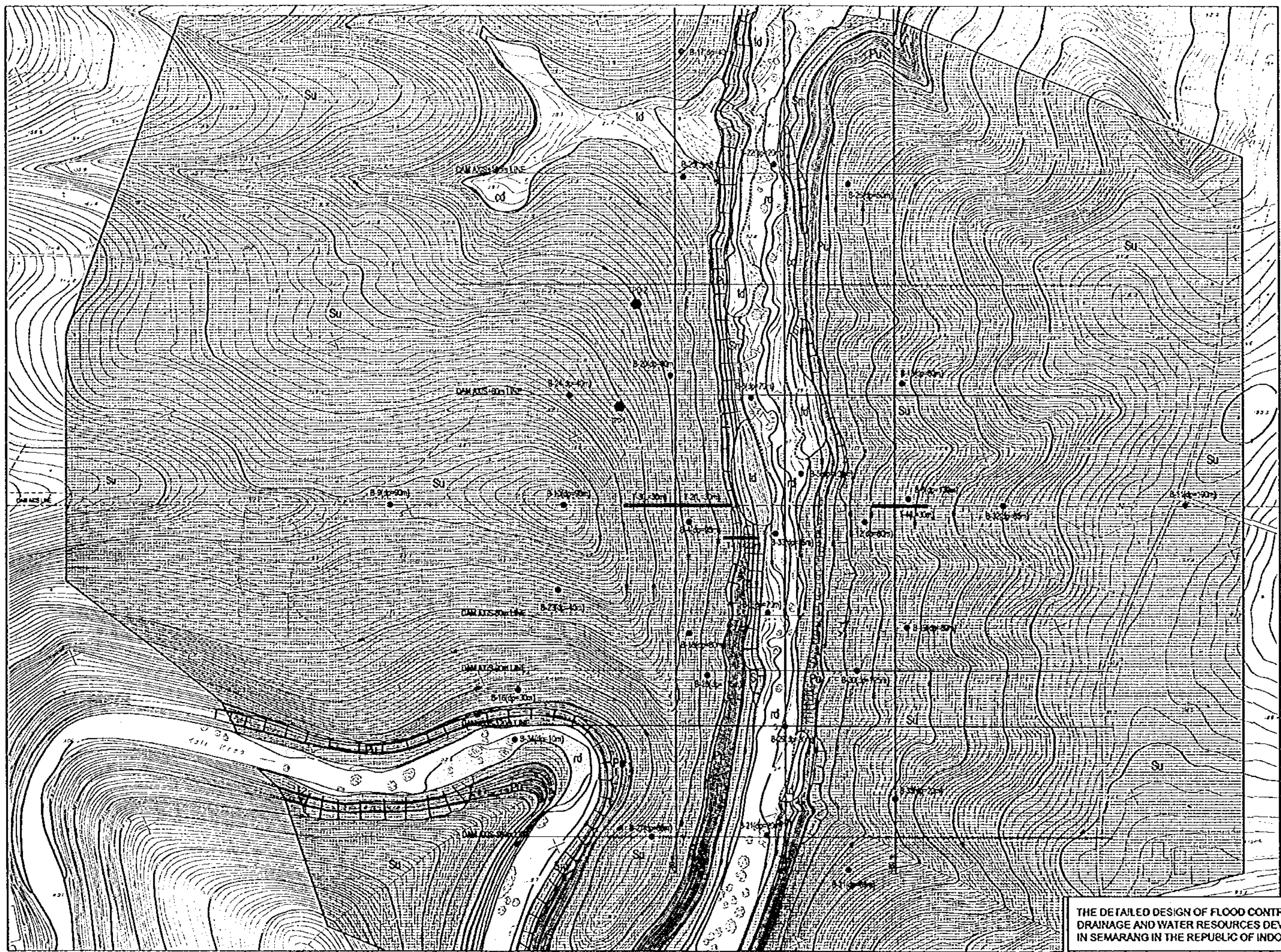
(LOCATION OF BORING HOLES AND TRENCHES)

HOLE NUMBER(TOTAL DEPTH)

TRENCH NUMBER(TOTAL LENGTH)

Note : Location of Geological Survey Area is shown in Fig. 2.2.6.

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 1.1.1
JAPAN INTERNATIONAL COOPERATION AGENCY	LOCATION MAP OF THE GEOLOGICAL SURVEY (RESERVOIR AREA)



LEGEND

(Geological Strata)

Age			Formation and Strata Name	Symbol	Description
Quaternary	Holocene		Riverbed deposit	rd	Riverbed deposit consists of Gravel, sand and clay. And it contains the huge fallen rocks in the gorge area, which was made by Kreo river.
			Talus deposit	td	Talus deposit consists of collapse soil and sand, detritus, fallen rocks. And it is accumulated on the foot of mountainside slope and cliff.
Tertiary-Quaternary	Pliocene-Pleistocene	Damar	Upper Sedimentary Rock Unit	Su	The unit mainly consists of alternation of conglomerate, conglomeratic sandstone, tuffaceous sandstone and sandstone, and partly contains mafic tuff and volcanic conglomerate. The change of grain size of sandstone is big, and lamina is formed partly. The matrix of conglomerate consists of same material of sandstone, and gravel consists of andesite and pumice, and diameter of gravel is smaller than 50cm. Cracks hardly develop in the bedrock, and the degree of cementation of conglomerate, tuffaceous sandstone, sandstone and tuff is comparatively low, and lower cementation layer is formed partly in sandstone, conglomerate.
			Upper Pyroclastic Rock Unit		The unit mainly consists of volcanic breccia, and partly contains mafic tuff and andesite lava. The volcanic breccia contains fragments of andesite and pumice, and matrix consists of mafic tuff. Cracks hardly develop in the bedrock, and the hardness of rock is comparatively high.
			Middle Sedimentary Rock Unit	Sm	The unit mainly consists of alternation of conglomerate, conglomeratic sandstone, sandstone and tuffaceous sandstone, and partly contains mafic tuff. The facies of each rock and conditions of bedrock are almost same as the upper sedimentary rock unit.

BOUNDARY OF GEOLOGICAL UNIT AND STRATUM

(LOCATION OF BORE HOLES AND ADITS AT THE PHASE 1 INVESTIGATION)

● : BORE HOLE (NUMBER, TOTAL DEPTH)

— : ADIT (NUMBER, TOTAL LENGTH)

(LOCATUON OF BORING HOLES AND TEST PITS AT THE PHASE 2 INVESTIGATION)

● : BORE HOLE (NUMBER, TOTAL DEPTH)

⬢ : TEST PIT (NUMBER)

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

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 1.1.2

LOCATION MAP OF THE GEOLOGICAL SURVEY (DAMSITE)

PT. Indra Karya (Persero)
Consulting Engineers

Fig. 1.1.3 **DRILL LOG**

HOLE No. B - 4

PROJECT	JATIBARANG DAM		DEPTH	95.00 M	ELEVATION	137.766 M
SITE	DAMSITE	COORDINATE X = 9,222,232.940 Y = 428,237.753	INCLINATION	VERTICAL	DRILL RIG	YBM - SOZ
CLIENT	J.I.C.A	DATE Dec. 21, 1997 till Jan. 11, 1998	DRILLED BY	SUJIMAN	LOGGED BY	DIDIK PRANOWO

DATE	SAMPLING	DEPTH		ELEVATION	COLUMN SECTION	DESCRIPTION	GROUND WATER LEVEL	ROCK GRADE	CORE RECOVERY %	R Q D %	WATER PRESSURE TEST LUGEON VALUE
									50	50	0 10 20 30 40 50
DECEMBER 21, 1997			0.60	137.166		TOP SOIL , soft , brown			100	0	
		1									
			2.00	135.766		SILTY TUFF , soft , brown		D	100	0	
		2									
		3							100	0	
		4							100	0	
		5							100	0	
		6				HIGHLY WEATHERED TUFF, CONGLTIC S'STONE , (nearly Lapilli - Tuff) , soft , brown ~ light brown		D	100	0	
		7							100	0	
		8							100	0	
			8.90	128.866					100	0	
		9									
			10.00	127.766		CONGLOMERATE , poor cemented with boulder Ø.12 cm , brownish grey		D	100	0	
		10									
			10.35	127.416		TUFF. SANDSTONE , medium grained , grey		D			
			10.65	127.116		TUFF , fine grained , light grey		D	100	0	
		11				SANDSTONE , coarse grained , light grey		D			
			11.85	125.916					100	10	
		12									
			12.55	125.216		TUFF. SANDSTONE , medium grained , grey		D	100	40	Lugeon Value = 2.80
		13				CONGLOMERATE , good cemented , grey		CL - L			Critical Pressure = 3.33 kg/cm²
			13.20	124.566		TUFF , soft , light grey		D			
			13.30	124.466		TUFF. SANDSTONE , fine grained , grey		D	90	20	
			13.60	124.166		TUFF. CONGLTIC S'STONE , coarse grained , brown		D			
		14	13.80	123.966		SANDSTONE , coarse grained , compact , grey		CL - L			
			14.20	123.566							
			14.35	123.416		TUFF , soft , light grey		D	100	20	
			14.70	123.066		TUFF. CONGLTIC S'STONE , coarse grained , grey		D			
		15	14.85	122.916		TUFF , soft , light grey		D			
			15.00	122.766		CONGLTIC S'STONE , dense , light brown		CL - L			
			15.25	122.516		SANDSTONE , med. grained , compact , brown		CL - H	100	40	
		16				SANDY TUFF , fine grained , soft , grey		D			
			15.85	121.916		TUFF. S'STONE , fine grained , included gravels , grey		CL - H	90	25	
		17	16.90	120.866							
		18				PUMICE TUFF , dense , yellowish grey		CL - L	90	25	Lugeon Value = 4.29
			18.10	119.666							Critical Pressure = 3.85 kg/cm²
		19							100	25	
		20							90	30	
DECEMBER 26, 1997		21							100	20	
		22							100	10	
									100	15	

Drilling date	Depth (m)	Elevation (m)	Description	Class
DECEMBER 25, 1997	15.25	122.516	SANDSTONE , med. grained , compact , brown	CL - H
	15.85	121.916	SANDY TUFF , fine grained , soft , grey	D
	16.90	120.866	TUFF. S'STONE , fine grained , included gravels , grey	CL - H
	18.10	119.666	PUMICE TUFF , dense , yellowish grey	CL - L
DECEMBER 25, 1997 / DECEMBER 26, 1997 / DECEMBER 27, 1997	31.30	106.466	VOLCANIC BRECCIA , compact , brownish grey	CM - H
DEC. 28, 1997	32.80	104.966	SANDSTONE , coarse grained , laminae observed , locally congl'tic s'stone , compact , blackish grey	CM - H
	33.10	104.666	TUFF , finegrained , soft , light brown	D
DECEMBER 29, 1997	33.95	103.816	TUFF. S'STONE , f. grained , dense ~ compact , brown	CL - L
	35.00	102.766	SANDSTONE , fine grained , dense ~ compact , brown	CL - L
	37.95	99.816	SANDSTONE , fine ~ coarse grained , dense , laminae observed , pumice tuff (37.20 ~37.30 & 37.40 ~ 37.55)	D
	39.70	98.066	PUMICE TUFF , dense , yellowish light brown , with organic black (38.20 ~ 38.40)	D
DECEMBER 30, 1997			CONGLOMERATIC SANDSTONE , laminae observed locally coarse sandstone , compact , brown	CM - L

Core recovery (%)	RQD (%)
100	40
90	25
90	25
100	25
90	30
100	20
100	10
100	15
100	30
100	25
100	10
100	10
100	40
100	35
100	40
100	30
100	30
100	20
100	40
100	90
100	0
100	0
100	0
100	0
100	0
100	60
100	35
100	50
100	47
100	60

Lugeon Value	Critical Pressure
4.29	3.85 kg/cm^2
1.86	10.01 kg/cm^2
0.75	10.07 kg/cm^2
1.70	4.95 kg/cm^2
3.93	8.57 kg/cm^2
3.08	7.49 kg/cm^2

DECEMBER 29, 1997 — DECEMBER 30, 1997 — DECEMBER 31, 1997 — JANUARY 02, 1998 — JANUARY 03, 1998 — JANUARY 04, 1998

37							
38	37.95	99.816				100	0
39				PUMICE TUFF , dense , yellowish light brown , with organic black (38.20 ~ 38.40)	D	100	0
40	39.70	98.066				100	0
41						100	60
42						100	35
43				CONGLOMERATIC SANDSTONE , laminae observed locally coarse sandstone , compact , brown	CM - L	100	50
44						100	47
45	44.90	92.866				100	60
				TUFF , yellowish grey	D		
46	45.00	92.766		SANDSTONE , med. grained , compact , brown	CL - L	100	0
	46.60	91.166				100	40
47	46.95	90.816		TUFF. S'STONE , fine grained , compact , brown	CL - L		
	47.35	90.416		SANDSTONE , medium grained , compact , brown	CL - L		
	47.50	90.266		TUFF , fine grained , yellowish grey	D	100	35
	47.55	90.216		SANDSTONE , fine grained , dense , blackish grey	D		
48	48.00	89.766		TUFF. S'STONE , nearly lapilly tuff , c. grained , grey	CL - L		
49				SANDSTONE , fine ~ medium grained , laminae observed , compact , light grey	CL - L	100	0
	49.05	88.916		CONGL'TIC S'STONE , pumice Ø0.3 ~ 0.5 cm , included basalt , dark grey	D	100	25
	49.60	88.166					
50	49.75	88.016		SELTSTONE , dense , blackish grey	D		
51				MUDDY TUFF , included pumice , dense , blackish grey	D	100	24
	51.50	86.266					
52				SANDSTONE , fine grained , laminae observed included pumice , grey	CL - L	100	18
53	52.35	85.416		TUFF , pumice rich , yellowish grey	CL - L	100	25
	53.50	84.266				100	0
54						100	0
55							
56						100	20
57						100	15
58						100	28
59						100	30
60						100	25
61						100	40
62						100	20
63						100	20
64						100	36
65						100	30
66						100	15

Lugeon Value = 3.93
Critical Pressure = 8.57 kg/cm²

Lugeon Value = 3.08
Critical Pressure = 7.49 kg/cm²

Lugeon Value = 1.45
Critical Pressure = 7.55 kg/cm²

Lugeon Value = 0.05
Critical Pressure = 11.51 kg/cm²

Lugeon Value = 0.08
Critical Pressure = 11.51 kg/cm²

Lugeon Value = 0.43
Critical Pressure = 13.51 kg/cm²

JAN. 05 | JANUARY 04, 1998 | JANUARY 03, 1998

JAN. 08 | JANUARY 07, 1998 | JANUARY 06, 1998

56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70				VOLCANIC BRECCIA , compact , with some boulders Ø 15 ~ 40 cm , light grey	CM - H	
71						
72						
73						
74						
75						
76	75.95	61.816				
	76.10	61.666		TUFF , dense , grey	CL - H	
77						
78						
79						
80						
81				VOLCANIC BRECCIA , compact , light grey	CM - H	
82						
83						
84						
85						

100	16	
100	28	Lugeon Value = 0.08 Critical Pressure = 11.51 kg/cm²
100	50	
100	25	
100	40	
100	20	
100	30	Lugeon Value = 0.43 Critical Pressure = 13.51 kg/cm²
100	36	
100	30	
100	15	
100	50	
100	30	Lugeon Value = 1.42 Critical Pressure = 4.52 kg/cm²
100	25	
100	20	
100	25	
90	10	
100	30	Lugeon Value = 0.47 Critical Pressure = 13.51 kg/cm²
80	20	
80	20	
100	10	
90	10	
90	15	Lugeon Value = 0.85 Critical Pressure = 9.52 kg/cm²
100	15	
100	25	
100	15	
90	35	
100	20	Lugeon Value = 0.89 Critical Pressure = kg/cm²
100	28	
100	17	

JANUARY 06, 1998	71					100	25	
	72					90	10	
	73					100	30	Lugeon Value = 0.47 Critical Pressure = 13.51 kg/cm²
	74					80	20	
	75					80	20	
JANUARY 07, 1998	76	75.95 / 76.10	61.816 / 61.666	TUFF , dense , grey	CL - H	100	10	
	77					90	10	
	78					90	15	Lugeon Value = 0.85 Critical Pressure = 9.52 kg/cm²
	79					100	15	
	80					100	25	
JANUARY 08, 1998	81			VOLCANIC BRECCIA , compact , light grey	CM - H	100	15	
	82					90	35	
	83					100	20	Lugeon Value = 0.89 Critical Pressure = kg/cm²
	84					100	28	
	85					100	17	
JAN. 09, 1998	86					100	10	
	87					100	10	
	88					90	25	Lugeon Value = 1.34 Critical Pressure = 13.47kg/cm²
JANUARY 10, 1998	89					100	15	
	90	90.00 / 90.10	47.766 / 47.666	TUFF , fine grained , light grey	D	90	30	
	91					100	0	
	92					100	0	
	93			SAND , loose , medium grained with conglomerate (91.70 ~ 91.80) & coarse sandstone (93.65 ~ 93.75)	D	100	0	Lugeon Value = 3.43 Critical Pressure = 6.49 kg/cm²
JAN. 11	94					100	0	
	95	95.00	42.766	END OF DRILLING		100	0	

* R. Q. D. = Rock Quality Designation = (Total Length of Cylindric Cores longer than 10 cm) / (Total Core Length) x 100 %
* LUGEON VALUE is ltr/min/mtr under injection water pressure by 10 kgf/cm2
* G. W. L. = Ground Water Level = Height of Spring Water