KARACHI GUIDE MAP

SCALE 1 : 40,000

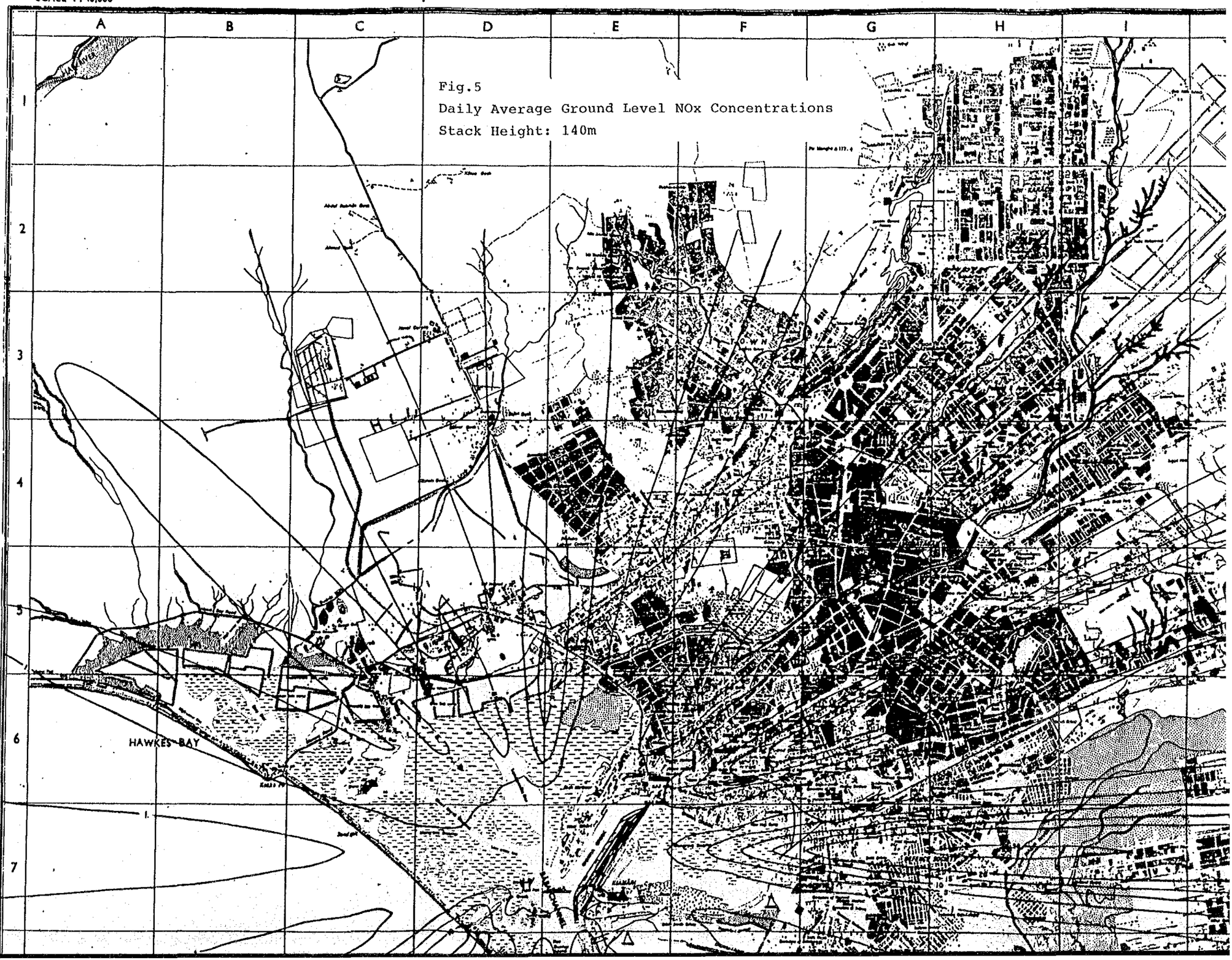

Fig.5
Daily Average Ground Level NOx Concentrations
Stack Height: 140m

KARACHI GUIDE MAP

FIRST EDITION

SURVEYED 1982-83.

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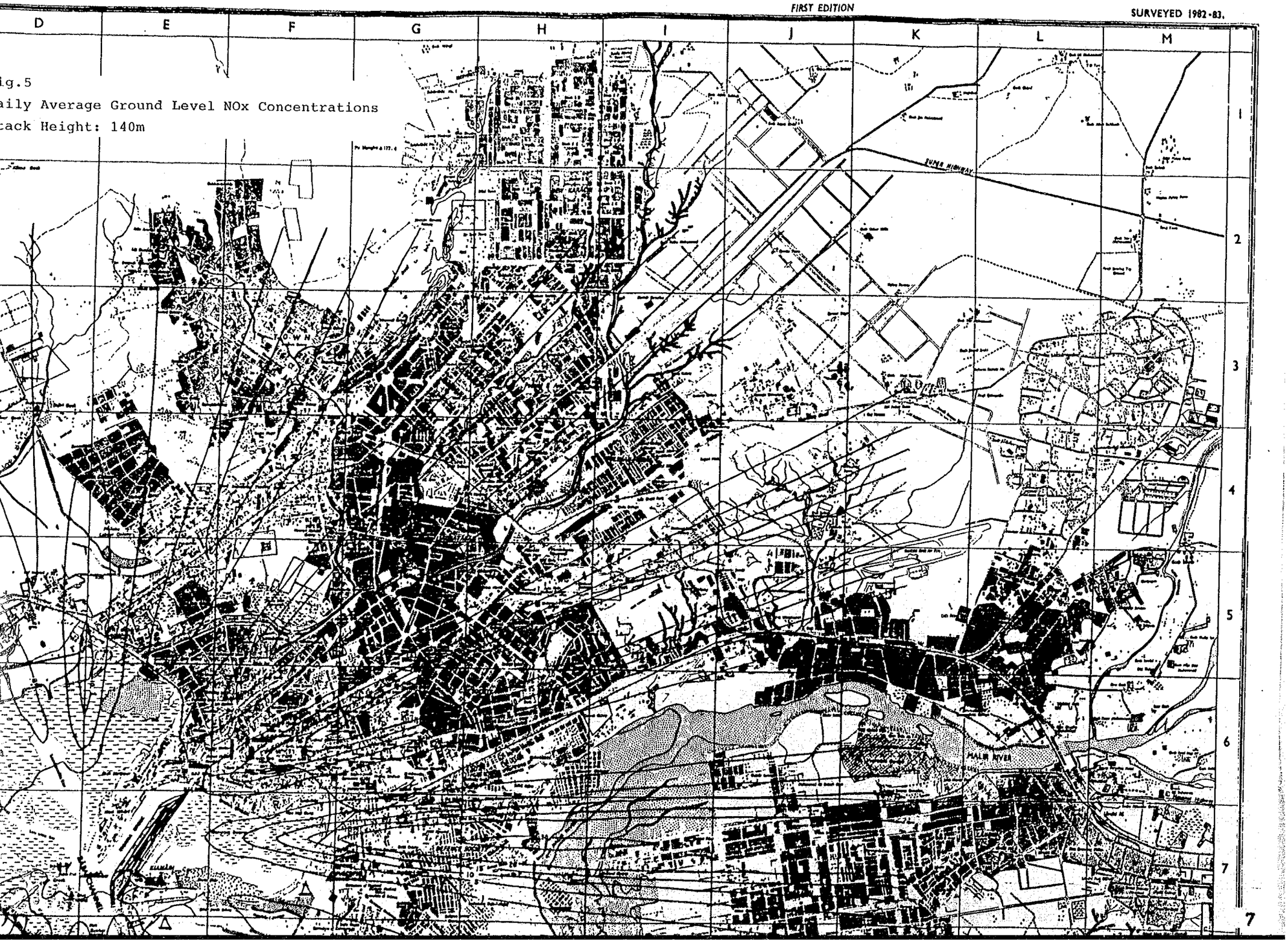
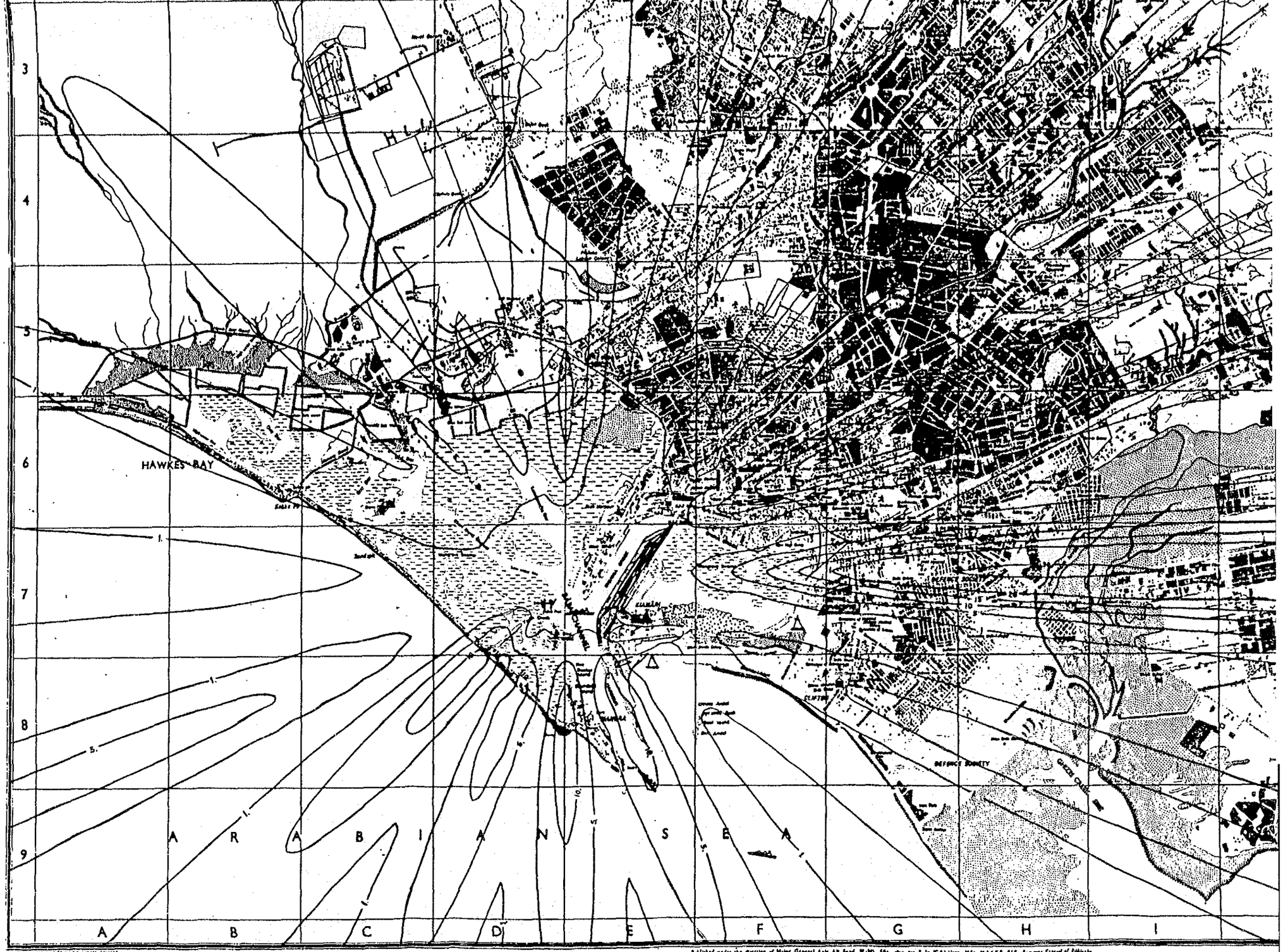
aily Average Ground Level NOx Concentrations

tack Height: 140m

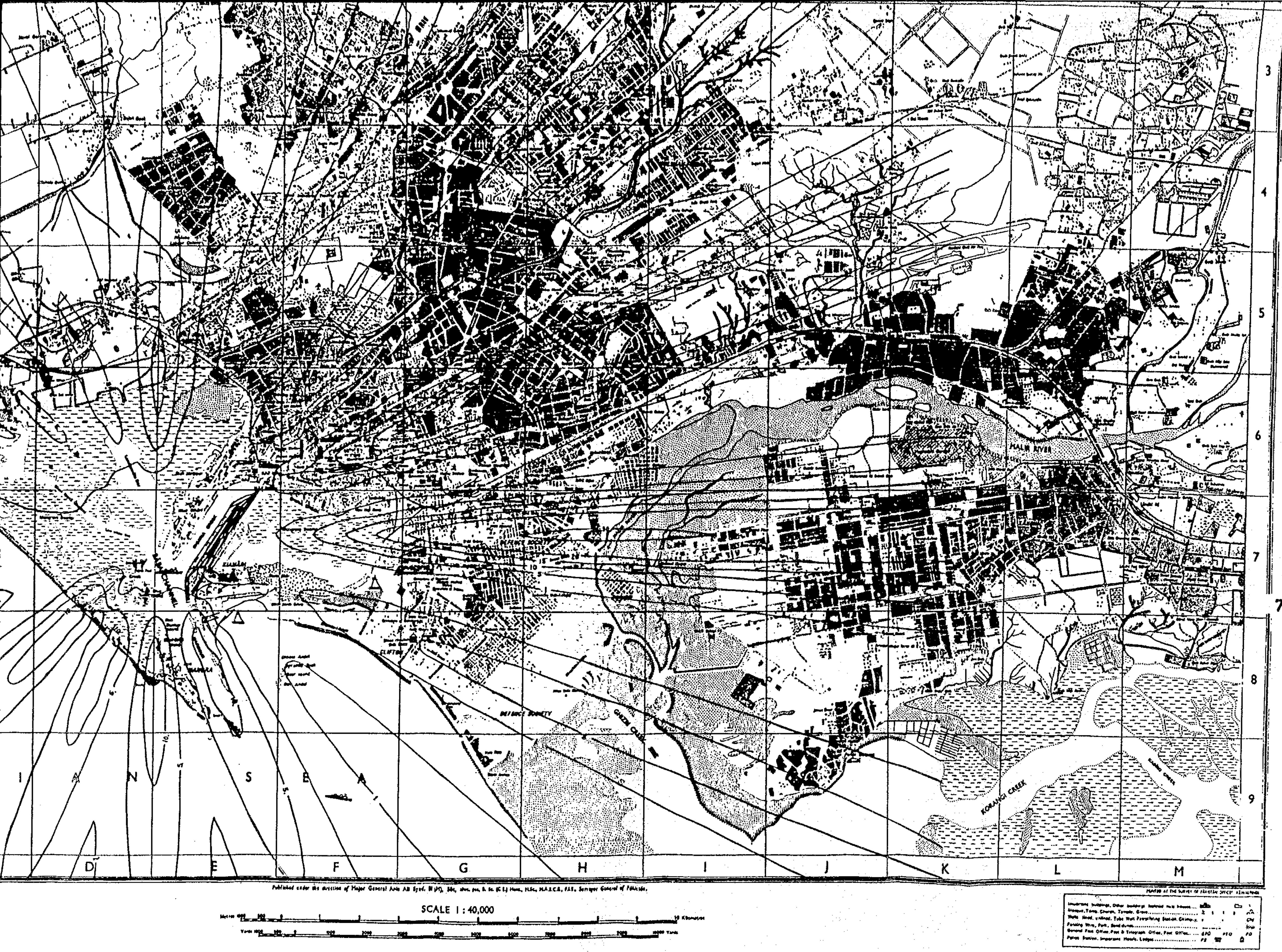




Refer to this Map as: 1:40,000
KARACHI GUIDE MAP FIRST EDITION.

SCALE 1 : 40,000

488


MALIR RIVER
KORANGI CREEK
CLIFTON
DEFENCE SOCIETY
D
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SCALE 1 : 40,000

EP-1-19

Fig. 6 Distance from The Emission Source
Versus
SOx Ground Level Concentration (1-hour Value)
Case 1: Stack height 140.0 m

Stack height	140.0 (M)	
Emission quantity	2280.2 (Nm^3/H)	
Wind velocity	4.9 (M/S)	
Stability D	Max. concentration 138.087	Distance (KM) 10.95

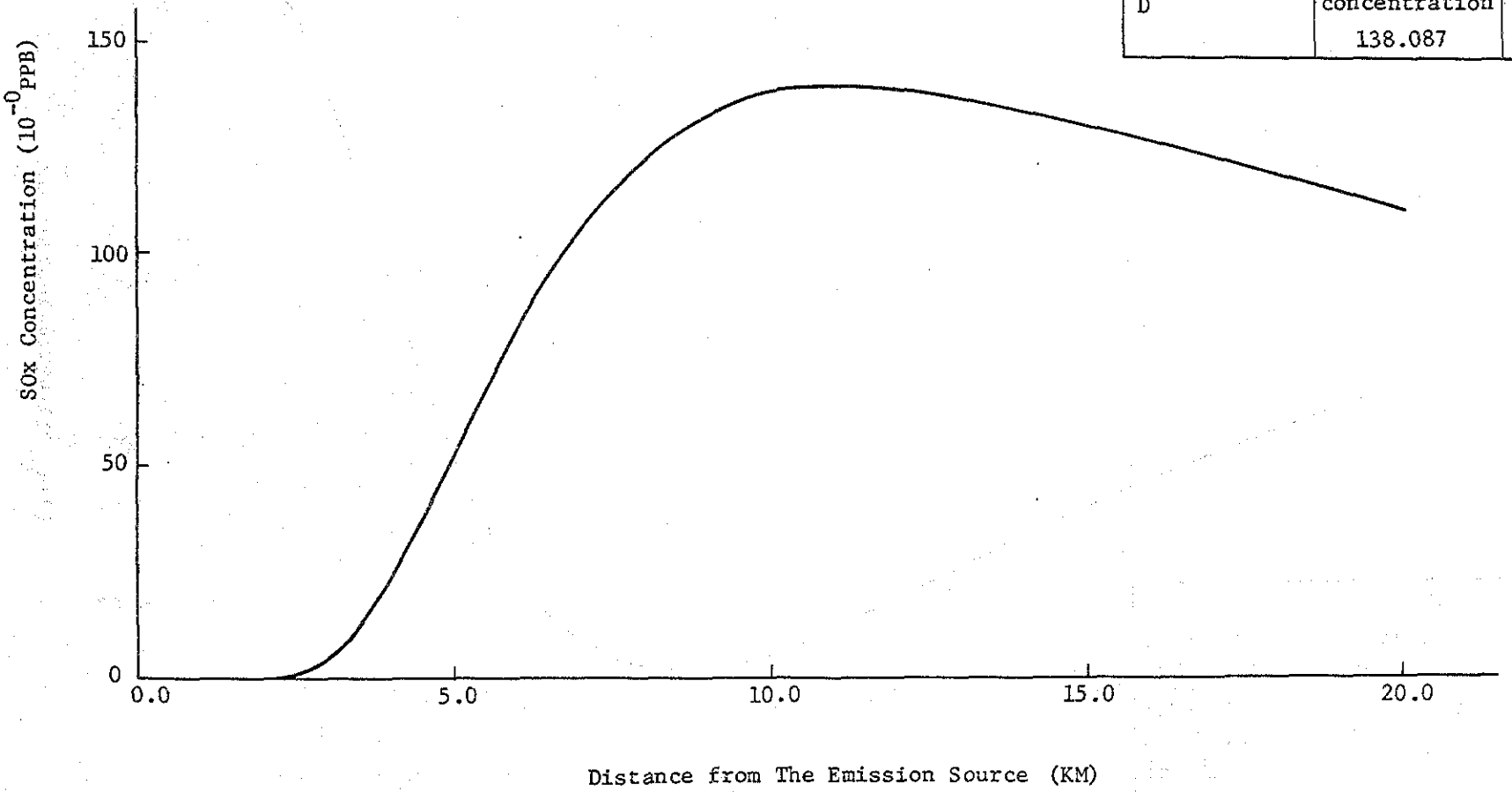
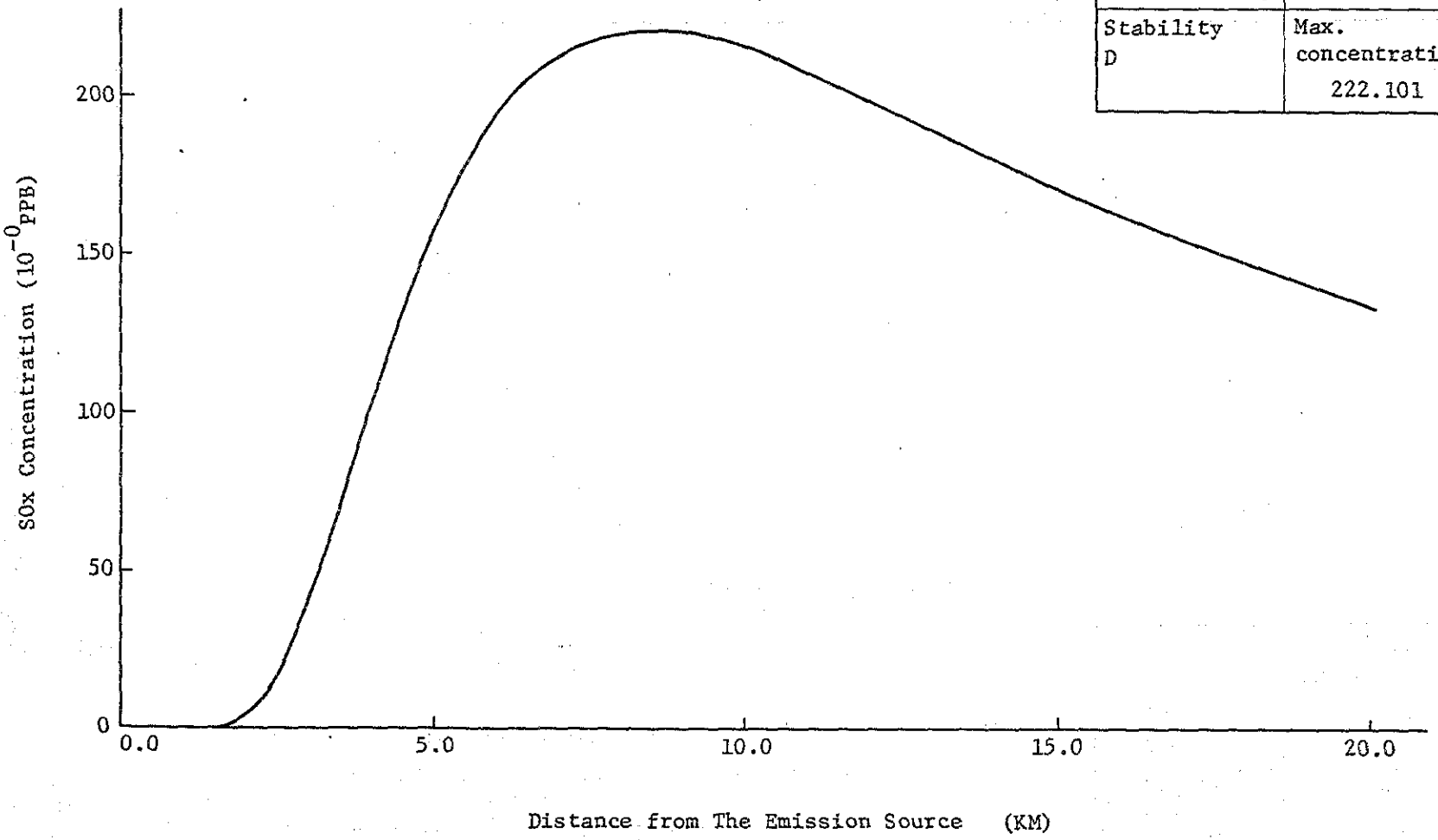


Fig. 7 Distance from The Emission Source
Versus
SOx Ground Level Concentration (1-hour Value)

Case 2: Stack height D100.0 m

Stack height	100.0 (M)	
Emission quantity	2280.2 (Nm^3/H)	
Wind velocity	4.9 (M/S)	
Stability D	Max. concentration	Distance (KM)
	222.101	8.50



4/89

EP-2 STUDY OF WASTE WATER TREATMENT

The following table shows limited values of water pollution issued by the authority of Japan and Pakistan.

Unit: mg/l

Item	Japanes standard	Pakistan standard Up to 1990	Pakistan standard After 1990
(1) Toxic material		Toxic material	Toxic material
Cd	0.1	2.0	0.1
Cn	1	2.0	1.0
O-P	1		
Pb	1		
Cr	0.5	2.0	1.0
As	0.5	2.0	1.0
T-Hg	0.005	0.1	0.01
R-Hg	ND	-	-
PCB	0.003	-	-
(2) General material		General material	
F	15	20	20
Colitis	(3,000)		
pH	5.8 - 8.6 (inland water)		
	5 - 9 (sea water)	5.5 - 9.5	6.0 - 9.0
BOD	160 (120) (inland water)	200	150
COD	160 (120) (sea water)	400	200
SS	200 (150)	400	200
n-hexane extracts	5	20	10
Phenol	5	1.5	0.3
Cu	3	4.0	1.0
Zn	5	10.0	5
Fe	10	10.0	2.0
Mn	10	10.0	1.5
Cr	2	-	-
Ni	--	-	-

From the preceding table, the regulation values of Japanese Standard and Pakistan Standards do not differ much up to 1990. However, regulation value for that of after 1990 seems severe in mineral metals as compared with Japanese standard.

To prevent the water pollution in the area of Karachi sea zone, the

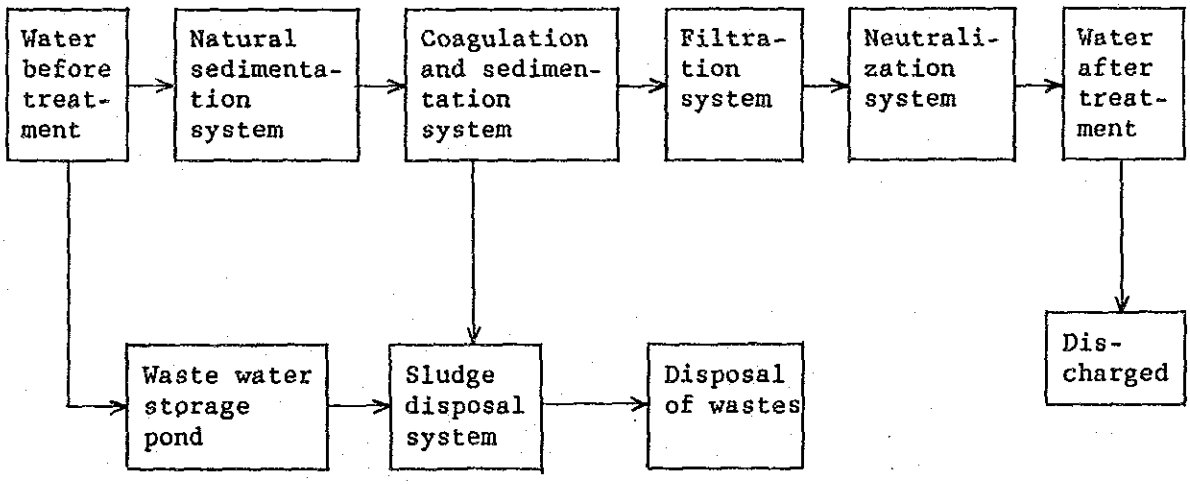
countermeasures must be taken into consideration in discharged water from the power plant so as to meet the regulation values issued by authorities of Pakistan and Japanese Government.

(b) In thermal power plants, there are many pollutant sources such as regenerative waste water discharged from the water treatment system, high suspended waste water from air preheater cleaning, boiler furnace washing and chemical cleaning water.

These waste waters, if discharged directly into the sea, will have a harmful effect on the entire surrounding sea area.

To effectively remove these pollutants contained in the waste water and prevent pollution of sea water, the coagulation-sedimentation, filteration and neutralization waste water treatment systems should be furnished for Units 1 and 2.

Waste Water Treatment Process



EP-3 NOISE CONTROL

Concerning noise control, JICA Study Team is intending to design the equipment for the power plant based on the following values of sound level:

(1) Design of outdoor equipment

The sound level in a free field at the boundary line shall be as follows:

Octabe Band	1	2	3	4	5	6	7	8
Center-Line Frequency (Hz)	63	125	250	500	1,000	2,000	4,000	8,000
Levels-Decibels [dB(A)]	80	73	64	60	61	52	49	46

(2) The maximum sound level for the indoor equipment should be designed so that the Levels-Decibels should be 90 when the center-line frequency is 1,000 Hz.

PR-1 CONSTRUCTION SCHEDULE

As shown in the details of the construction method on the implementation schedule, (Refer to attached schedule), the dismantling work of the existing "BX" Station shall be started after completion of the new 220 kV/132 kV transmission(s) and distribution systems.

However, in order to keep the overall implementation schedule of the project, the said new systems should be contracted seven (7) months before contract signing of the power plant Units 1 and 2. Also, the shifting work of the 66 kV outdoor switchyard to be carried out by the Owner should completely be finished before starting the construction work of the said new systems.

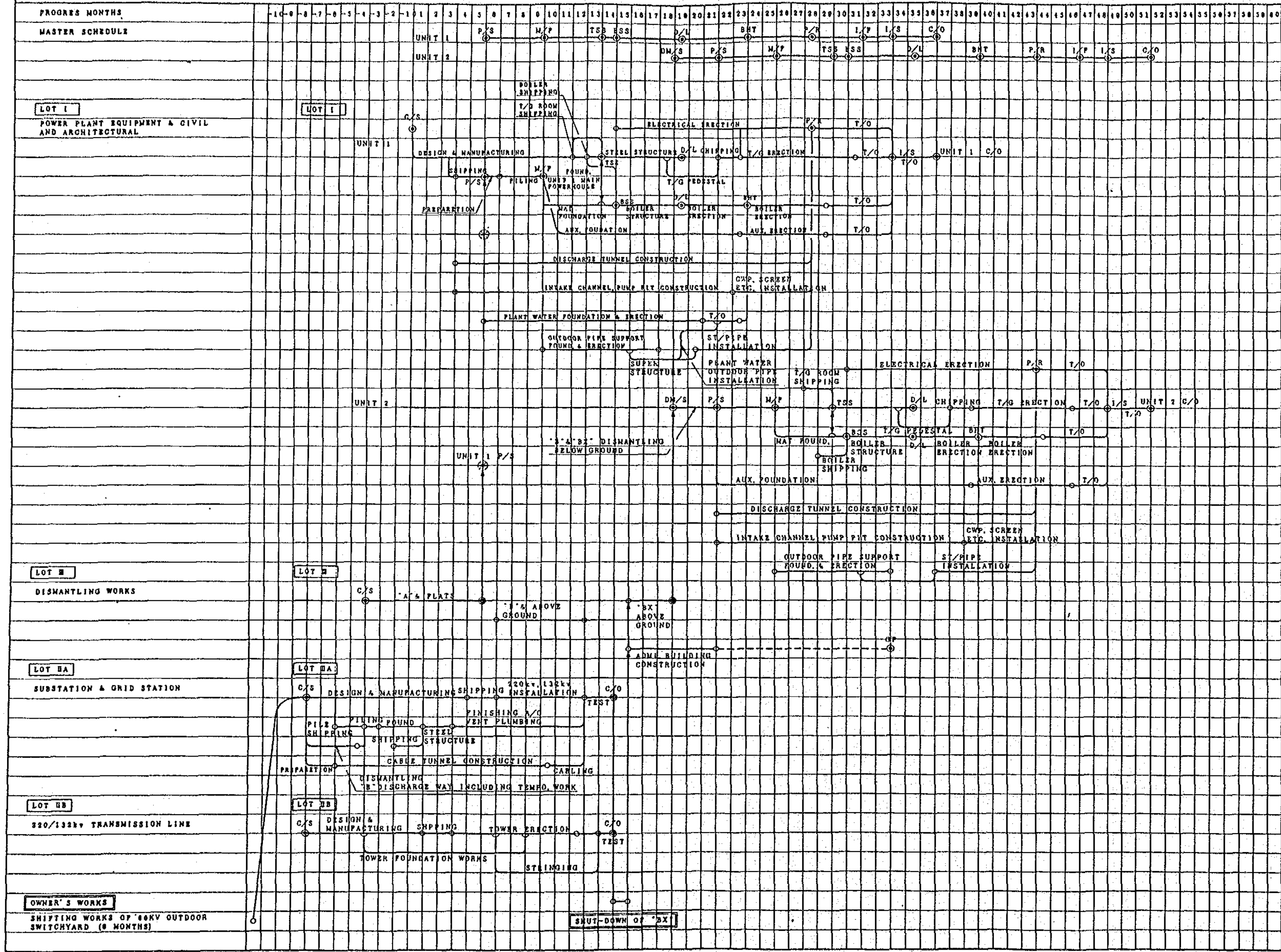
Consequently, the first unit of 200 MW power plant is envisaged to be completed thirty-six (36) months after contract signing of LOT I, with the second unit to be completed fifteen (15) months after completion of the first unit.

MESSRS: KARACHI ELECTRIC SUPPLY CORPORATION

PROJECT: WEST WHARF THERMAL POWER PLANT PROJECT

SCHEDULE OF IMPLEMENTATION (TENTATIVE)

No. WGT-1003		COPY TO
DATE 10TH JAN 1990		
DIV.		



PROGRES MONTHS
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
MASTER SCHEDULE
UNIT 1
P/S M/F TSS BSS D/L BHT P/R I/F I/S C/O
UNIT 2
DM/S P/S M/F TSS BSS D/L BHT P/R I/F I/S C/O
LOT I
POWER PLANT EQUIPMENT & CIVIL AND ARCHITECTURAL
LOT I
C/S
UNIT 1
BOILER SHIPPING
T/G ROOM SHIPPING
ELECTRICAL ERECTION
DESIGN & MANUFACTURING
STEEL STRUCTURE
D/L
CHIPPING
T/G ERECTION
T/O
I/S
UNIT 1 C/O
SHIPPING
M/F
FOUND. UNIT 1 MAIN POWERHOUSE
P/S
PILING
T/G PEDESTAL
PREPARATION
MAT FOUNDATION
BOILER STRUCTURE
BOILER ERECTION
BHT
AUX. FOUNDATION
AUX. ERECTION
DISCHARGE TUNNEL CONSTRUCTION
INTAKE CHANNEL PUMP PIT CONSTRUCTION
CWP, SCREEN ETC. INSTALLATION
PLANT WATER FOUNDATION & ERECTION
OUTDOOR PIPE SUPPORT FOUND. & ERECTION
ST/PIPE INSTALLATION
SUPER STRUCTURE
PLANT WATER OUTDOOR PIPE INSTALLATION
T/G ROOM SHIPPING
P/R
UNIT 2
DM/S
P/S
M/F
TSS
D/L
CHIPPING
T/G ERECTION
T/O
I/S
UNIT 2 C/O
"B" & "BX" DISMANTLING BELOW GROUND
MAT FOUND.
BSS
T/G PEDESTAL
BHT
BOILER STRUCTURE
BOILER ERECTION
BOILER ERECTION
BOILER SHIPPING
UNIT 1 P/S
AUX. FOUNDATION
AUX. ERECTION
DISCHARGE TUNNEL CONSTRUCTION
INTAKE CHANNEL PUMP PIT CONSTRUCTION
CWP, SCREEN ETC. INSTALLATION
OUTDOOR PIPE SUPPORT FOUND. & ERECTION
ST/PIPE INSTALLATION
LOT II
DISMANTLING WORKS
LOT II
C/S
"A" & FLATS
"B" & ABOVE GROUND
"BX" ABOVE GROUND
GP
ADMN BUILDING CONSTRUCTION
LOT IIIA
SUBSTATION & GRID STATION
LOT IIIA
C/S
DESIGN & MANUFACTURING
SHIPPING
220kv, 132kv INSTALLATION
C/O
TEST
FINISHING A/C VENT PLUMBING
PILE SHIPPING
PILING
FOUND.
SHIPPING
STEEL STRUCTURE
CABLE TUNNEL CONSTRUCTION
CABLING
PREPARATION
DISMANTLING "B" DISCHARGE WAY INCLUDING TEMPO. WORK
LOT IIIB
220/132kv TRANSMISSION LINE
LOT IIIB
C/S
DESIGN & MANUFACTURING
SHIPPING
TOWER ERECTION
C/O
TEST
TOWER FOUNDATION WORKS
STRINGING
OWNER'S WORKS
SHIFTING WORKS OF 66KV OUTDOOR SWITCHYARD (6 MONTHS)
SHUT-DOWN OF "BX"

- C/S : CONTRACT SIGNING
- P/S : PILING START
- M/F : MAT FOUNDATION START
- TSS : TURBINE STEEL STRUCTURE START
- BSS : BOILER STEEL STRUCTURE START
- D/L : DRUM LIFTING
- BHT : BOILER HYDROSTATIC TEST
- P/R : POWER RECEIVING
- I/F : INITIAL FIRING
- I/S : INITIAL STEAMING
- C/O : COMMERCIAL OPERATION
- T/O : TEST & TRIAL OPERATION
- DM/S : DISMANTLING WORK START
- AUX. : AUXILIARY EQUIPMENT
- GP : GUARANTEE PERIOD
- ▭ : INTERNATIONAL TENDER
- ▭ : OWNER'S WORK
- ⊙ : EVENT
- ◎ : KEY DATE OF THE CONTRACT

REMARKS

REV. No.	APPROVED BY	CHECKED BY	DRAWN BY
REV. DATE			
CONTENTS			

704

PR-2 CONSTRUCTION COST

Estimation of the construction cost of the project was revised based on the results of the Detailed Design Study.

The project cost consists of two steam power generating units, 1 and 2, the civil and architectural works, the related transmission line, the substation at the West Wharf site and extension of the Baldia Grid station, as well as the Engineering Services Fee.

The cost covers the expected freight, insurance, contigencies, equipment, materials and erection works.

As far the civil and architectural works, the construction cost is estimated based on the Bill of Quantities, which, in turn, is based on the detailed design.

The cost of the power plant equipment has been revised based on the tender prices of similar equipment in Pakistan, those of the other foreign projects and in consideration of the feasibility study results of this project.

Summary of Construction Cost

1. Lot I Cost — Unit x 10^6

	F/C (Yen)	L/C (Rs)	Remarks
Power Plant			
Unit 1	19,569.84	3,945.96 (628.55)	Excluding Import Duty and Interest Fee
Unit 2	14,574.02	2,240.45 (358.42)	
Total	34,143.86	6,186.41 (986.97)	

2. Lot IIA Cost

	F/C (Yen)	L/C (Rs)	Remarks
Substation and Grid Station	4,808.31	845.09 (126.34)	Excluding Import Duty and Interest Fee

3. Lot IIB Cost

	F/C (Yen)	L/C (Rs)	Remarks
Transmission	1,102.54	348.92 (55.86)	Excluding Import Duty and Interest Fee

Note) F/C: Foreign Currency
L/C: Local Currency

Project Cost

Foreign Currency	40,054.79 x 10^6 Yen
Local Currency	6,850.86 x 10^6 Yen
	(1,096.14 x 10^6 Rs)

S-08

Lot I Power Plant Equipment

Unit x 10^6

	Estimated Cost		Remarks
	F/C (Yen)	L/C (Rs)	
Unit I			
1. Civil and Architectural	2,558.15	1,534.56 (245.53)	
2. Power Plant Equipment			
a. Boiler and its auxiliaries	3,942.86	587.57 (93.97)	
b. Turbine and its auxiliaries	4,479.28	321.96 (51.51)	
c. Common Auxiliary	1,841.34	250.00 (40.00)	
d. Electrical Equipment	3,212.40	157.69 (25.23)	
e. Plant Computer	380.00	(including items a - d)	
3. Spare Parts	710.12	-	
4. Ocean Freight	973.48	-	
5. Training	67.93	17.25	
6. Departmental Expenses	18.75	137.50 (22.00)	
7. Escalation	-	320.43 (51.27)	
8. Contingencies	692.82	493.75 (79.00)	
9. Consultant Fee	692.71	125.25 (20.04)	Converted ratio 1 Rs = 6.25
Total	19,569.84	3,945.96 (628.55)	

Unit x 10^6

	Estimated Cost		Remarks
	F/C (Yen)	L/C (Rs)	
Unit 2			
1. Civil and Architectural	994.22	754.00 (120.64)	
2. Power Plant Equipment			
a. Boiler and its auxiliaries	3,942.86	536.75 (85.88)	
b. Turbine and its auxiliaries	4,349.90	210.69 (33.69)	
e. Common Auxiliary	677.70	110.00 (17.60)	
d. Electrical Equipment	2,473.30	135.31 (21.65)	
e. Plant Computer	76.00	- (including items a - d)	
3. Spare Parts	420.00	-	
4. Ocean Freight	708.91	-	
5. Departmental Expenses	18.75	137.50 (22.00)	
6. Escalation	-	258.75 (41.40)	
7. Contingencies	597.38		
8. Consultant Fee	315.00	97.25 (15.56)	Converted Ratio 1 Rs = 6.25
Total	14,574.02	2,240.25 (358.42)	
Unit 1 + Unit 2	34,143.86	6,186.21 (986.97)	

SDA

Lot IIA

Substation and Baldia Grid Station

Unit x 10^6

	Estimated Cost		Remarks
	F/C (Yen)	L/C (Rs)	
Lot-IIA			
1. Civil and Architectural Work (including cable tunnel)	901.87	55.41	
2. Electrical Parts			
a. 6 x 220kV single core U/G Cables from W.W to Tower No. 1	562.00	56.88 (9.10)	
b. Substation (220kV/132kV GIS)	2,420.00	93.79 (15.00)	
c. 2 x 220kV Bays at Baldia incoming line	505.00	53.13 (8.50)	
3. Spare Parts	70.00	-	
4. Ocean Freight	75.00	-	
5. Escalation	-	518.75 (83.00)	
6. Contingencies	219.44	53.13 (8.50)	
7. Consultant Fee	55.00	14.00	Converted Ratio 1 Rs = 6.25
Total	4,808.31	845.09 (126.34)	

Transmission and Related Facilities

Unit x 10^6

	Estimated Cost		Remarks
	F/C (Yen)	L/C (Rs)	
Lot IIB			
1. Material	898.48	-	
2. Ocean Freight	85.59	-	
3. Erection including Civil Work and Testing	12.50	298.68 (47.79)	
4. Training	1.00	3.12 (0.50)	
5. Departmental Expenses	1.87	13.75 (2.20)	
6. Contingencies	49.80	15.62 (2.50)	
7. Consultant Fee	53.30	17.75 (2.87)	
Total	1,102.54	348.92 (55.86)	

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ATTACHMENT

1. Study Team Members and Their Areas of Specialty

The JICA Study Team members participated in the Detailed Design Study are as listed in the attached Table 1, together with their areas of specialty.

Members marked with the asterisk (*) are key study personnels.

2. Site Survey Records

Site survey records are briefly summarized in the attached Table-2.

Table 1 Study Team Members and Their Areas of Specialty

(* mark: Key Members)

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
Akio Oiwa	Leader* (Overall Control)	Control of site work	Overall control of the Detailed Design Study, overall control of editing of all reports Technical transfer to KESC
Chujiro Yoshioka	Technical Leader* (Boiler*)	Control of site survey work (Deputy Leader)	Overall control of all engineering work, basic design of boiler
Kyozo Kikuchi	Power Plant Engineering (Turbine*)		Basic design of power plant, basic design of turbine
Kiyoshi Sunagawa	Power Plant Engineering (Turbine)		Design of turbine and auxiliaries
Hideto Kaneko	Power Plant Engineering (Boiler)		Design of boiler and auxiliaries

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
Hiroyuki Kanehara	Power Plant Engineering (Boiler)	Study of power plant equipment, particularly boiler and auxiliaries	Design of boiler and auxiliaries
Satoru Fujimagari	Power Plant Engineering (Common Facilities*)	Study of over-all plant, particularly common facilities	Design of common facilities, water treatment, waste water treatment, environmental protection, coordination of power plant engineering
Hiroshi Iwabuchi	Power Plant Engineering (Common Facilities)	Study of over-all plant, particularly common facilities	Design of common facilities
Shunichi Kiyosawa	Power Plant Engineering (Control & Instrumentation*)		Design of plant control and instrumentation

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
Kazuo Muto	Power Plant Engineering (Electrical Equipment*)	Renovation of existing substations	Design of electrical equipment, sub-station in power plant site
Kimito Tuchiya	Power Plant Engineering		Design of electrical equipment
Takeomi Kodama	Civil Engineering*		Overall control of civil design, basic design of civil structures
Tsutomu Ogawa	Civil Engineering		Basic and detailed design of civil structures
Terukazu Inao	Civil Engineering	Field geologic and topographic survey and other surveys, preparation of execution plan and specifica-tions, technical guidance for	Design of civil structures

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
		work to be carried out by KESC	
Hidekazu Yamanouchi	Architectural/ Structural Engineering*		Overall control of architectural engineering, basic design
Hiroshi Kawase	Architectural/ Structural Engineering	Field geologic and topographic survey, preparation of execution plans and specifications	Architectural design plans, elevation of buildings and design of related facilities
Takayuki Aoyagi	Architectural/ Structural Engineering		Structural design, study of dismantling of existing facilities
Hiroshi Oto	Transmission* Substation Engineering		Overall control of transmission and substation engineering, basic design

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
Seiichiro Hirano	Transmission Line Engineering	Study/ topographic survey of 220 kV transmission line route, geological survey preparation of execution plans and specifications for survey work	Design of transmission line, tower design, underground cable design
Kazunao Yokota	Transmission Line Engineering (Overhead line)		System survey, basic design of transmission line
Akio Takahashi	Substation Engineering (Civil)		Design of foundations of substation equipment

516

Name	Assignment	Description of Work	
		(Site Work)	(Home Office Work)
Hitoshi Kamiyama	Transmission Line Engineering (Civil)	Topographic and geological survey along transmission line route, preparation of execution plan and specifications for survey work	Geological survey, tower foundation design, underground cable route design

Table-2 Site Survey Records

Site Visit	Period	Study Items	Perticipants
1st visit	11 Dec. - 25 Dec., 1988	Inception Report Additional site survey	Note 1
2nd "	5 Mar. - 19 Mar., 1989	Interium Report Additional site survey	Note 2
3rd "	15 Aug. - 29 Aug., 1989	Detailed Design Report (Draft)	Note 3
4th "	8 Oct. - 22 Oct., 1989	Tender Document (Draft)	Note 4
5th visit	3 Dec. - 17 Dec., 1989	Finalization of the Reports	Note 5

Participants

Note 1: Akio Oiwa, Chujiro Yoshioka, Hiroyuki Kanehara, Satoru Fujimagari, Hiroshi Iwabuchi, Kazuo Muto, Terukazu Inao, Hiroshi Kawase, Seiichiro Hirano and Hitoshi Kamiyama (10 persons)

Note 2: Akio Oiwa, Chujiro Yoshioka, Satoru Fujimagari, Kazuo Muto, Terukazu Inao, Hiroshi Kawase, Seiichiro Hirano and Hitoshi Kamiyama (8 persons)

Note 3: Akio Oiwa, Satoru Fujimagari, Kazuo Muto, Hiroshi Kawase and Seiichiro Hirano (5 persons)

Note 4: Akio Oiwa, Chujiro Yoshioka, Satoru Fujimagari, Hiroshi Kawase and Seiichiro Hirana (5 persons)

Note 5: Akio Oiwa, Satoru Fujimagari (2 persons)

ATT-8

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