パキスタン政府要請書

CAPITAL DEVELOPMENT AUTHORITY
SIMLY DAM PROJECT

No.CDA/SDP-6(2)/83/1644

Islamabad, Aug: 11, 1983.

Mr. Noriyoshi Konzo,
First Secretary,
Embassy of Japan,
ISLAMABAD.

Subject:- REQUEST FOR TECHNICAL/FINANCIAL ASSISTANCE FROM JAPANESE GOVERNMENT FOR CONDUCTION OF WATER FROM KHANPUR TO ISLAMABAD/RAWALPINDI.

Dear Sir,

Kindly refer to the meeting held in the office of Member(T),CDA on 11th July 1983 wherein following additional information was required by yourself :-

a. Master plan of utilization of Khanpur water.

b. Brief description of various alternatives available for conveyance of water.

I am enclosing herewith a master plan of Islamabad showing the requirements of each sector which would receive water from Khanpur source. A brief giving details of various alternatives for conveyance of water from Khanpur is also enclosed herewith at Annex "A".

Terms of reference were handed over to yourself during the meeting. However another copy is enclosed for information.

Yours faithfully,

(A. R. Javaid)
Project Director(Simly Dam)

DESCRIPTION OF DIFFERENT ALIGNMENTS FOR CONVEYANCE OF WATER FROM KHANPUR TO ISLAMABAD AND RAWALPINDI.

There are 3 different possible routes for conveyance of Khanpur water to Islamabad and Rawalpindi. These are :-

i. Nicholson Monument.
ii. Short Tunnel from Khanpur to Shah Allah Ditta.
iii. Long Tunnel from Khanpur to Golra.

Detailed description of each alternate is given below :-

I. Nicholson Monument.

WAPDA has already completed left Bank Canal System upto south of Margala Hills near Nicholson Monument. Water would be available at RL 1766 which is invert level of the southern portal of the tunnel. Water would then be stored in a raw water storage reservoir which is considered to necessary to allow for maintenance of open channel and also to provide flexibility for meeting peak demand.

After filteration and treatment, it would be taken to a low level reservoir in the adjoining Margala Hills at an elevation of RL 1980 ft.,60" dia twin conduction lines 7500 feet long.

Rawalpindi would take all its water from this reservoir by gravity whereas 50% of Islamabad supplies would require to be pumped to a high altitude reservoir. The project cost as worked out by M/s. Sanyo Consultants is given below :-

	Description.	Quantity.	Rate.	Amount Rs.1000)
1.	R.C. Conduit, D=8.0 ft.	2,500 ft.	5,000	12,500
2.	Raw Water Reservoir(Earth & Concrete).	625 MG.	100 ,000	62,500
3.	Treatment Plant.	125 MG.	2,500,000	312,500
4.	Pumping Station.			
	No.1 Pump,D=800mm, P=1,700KW	5 Units	15,000,000	75,000
	No.2 pump,D=450mm, P=400KW	3 "	6,000,000	18,000
	No.3 Pump,D=450mm, P=140Kw	5 "	4,000,000	20,000
5.	Steel Pipe Line.			
	No.1 pipe,D=1500mm,t=14mm, L=7,500 ft.x2 Pressure	2,400 ton.	16,000	38,400
	No.2 pipe, D=1500mm, t=12mm L=18,000 ftx2 Gravity	5,220 ton	16,000	83,520
	No.3 pipe,D=900mm, t=9mm L=7500 ftx1 Pressure	460 ton	16,000	7,360
	No.4 pipe, D=900mm,t-8mm	920 ton	16,000	14,720
	No.5 pipe, D=900mm, t-8mm L=18,000 ftx1 Gravity	970 ton	16,000	15,520
	No.6 pipe, D=1,100mm t=10mm L=27,000 ftx2, Gravity.	4,590 ton	16,000	73,440
6.	Regulating Tank.			
	Margala Hill WL=2,000	2.5 MG.	3,000,000	7,500
	Branch Point WL=1,960	2.5 MG	2,500,000	6,250
	Golra WL=2,000	0.9 MG	2,500,000	2,250

7.	Service Reservoir			
	Islamabad High water Zone. WL 2120	4.8 MG	2,500,000	12,000
	Islamabad low water Zone. WL 2000	5.0 MG	2,500,000	12,500
	Rawalpindi high Water Zone WL1920	5.8 MG.	2,500,000	14,500
	Rawalpindi low water Zone WL 1870	1.5 MG	2,500,000	37,500
8.	Miscellaneous.		14,040	
9.	Sub-total.		840,000	
10.	Engineering & Administration Fee(15% of (9)).		130,000	
11.	Contingency (15% of (9) + (10)).		150,000	
	Total :-		1,120,000	

II. Short Tunnel.

According to this proposal water is directly drawn from the reservoir through an intake tower which is then pumped to Choi plain at elevation of RL 2130. Water is then conveyed through a RCC gravity conduit 14,000 ft. long and through the margala hills by a tunnel 16,000 ft. long. Treatment works are located on southern side of margala hills and potable water would be available at RL 2060 thus Rawalpindi would get all supplies by gravity. About 90% Islamabad supplies would also be by gravity.

This alternate is only attractive if scheme is to be restricted for Islamabad only. If joint facilities are to be provided, as is planned now, then it is no more economical.

III. Long Tunnel.

According to this alternate water would be withdrawn from the reservoir through an intake tower to be constructed by CAISSON METHOD since the reservoir has already been created. Water would be conveyed to a point east of Golra Village on the southern side of Margala hills through a 37,000 ft. long tunnel where treatment works are located. Rawalpindi would get most of its supplies through gravity whereas Islamabad would required pumping for about 20 Mgd against a head of 200 ft.

This proposal is more attractive in view of the facts that less power is used as compared to the other alternatives in view of the energy crisis the entire world is facing. The cost estimate of this alternate as worked out by SANYO Consultants are given below :-

	Description.	Quantity	Rate.	Amount Rs.1000)
1.	Intake Tower at Khanpur Reservoir by Caisson Method, under water .	L.S.		25,000
2.	Pressure Tunnel,D=8.0 ft.	1,000 ft.	10,000	10,000
3.	Control Valves, D=1,500mm	2 Units.	250,000	500
4.	Long Distance Tunnel Tunnel, D=8.5 ft, Horse Shoe Type.	37,000 ft.	8,000	296,000
	Shaft,D=15 ft. Circle Section	400 ft.	15,000	600
5.	Raw Water Reservoir	125 MG	100,000	12,500
	Treatment Plant.	125 MG	2,500,000	312,500
7.	Pumping Station.			
	No.1 Pump, D=450mm,P=500KW	5 units	6,500,000	32,500
	No.2 Pump,D=450mm,P=200KW	3 units	5,000,000	15,000
	No.3 Pump,D=500mm,P=250KW	3 units	5,500,000	16,500

8.	Steel Pipe Line			
	No.1 pipe, D=1,200mm,t=12mm, L=6,000ft x 1,Pressure	660 ton	16,000	10,560
	No.2 pump, D=900mm,t=9mm L=2,000 ft x1, Pressure	120 ton	16,000	1,920
	No.3 pipe, D=1,200mm,t=11mm, L=17,000ft x2 lines,gravity	3,400 ton	16,000	54,400
	No.4 pipe,D=1200mm,t=12mm L=18,000ft x1 line,pressure	1,980 ton	16,000	31,680
9.	Service Reservoir,			
	Islamabad Low water	5.0 MG	2,500,000	12,500
	Islamabad high water	4.8 MG	2,500,000	12,000
	Rawalpindi low Water.	15.0 MG	2,500,000	37,500
	Rawalpindi High water.	4.8 MG.	2,500,000	14,500
10.	Miscellaneous			13,840
11.	Sub-total			910,000
12.	Engineering & Adminsitration fee(15% of 11)			140,000
13.	Contingency (15% of 11 + 12)			160,000
	Total:			1,210,000

These alignments are shown in the attached Plan.

REQUEST FOR TECHNICAL/FINANCIAL ASSISTANCE FROM GOVERNMENT OF JAPAN FOR CONDUCTION OF WATER FROM KHANPUR TO ISLAMABAD/RAWALPINDI.

I. Background Information.

1. The Metropolitan area, the twin cities of Islamabad and Rawalpindi is situated at the north-eastern corner in the north of Punjab Province. Islamabad, a new capital was shifted from Karachi in 1958-59 following the start of construction in 1961 in accordance with a policy formulated by the Central Government in 1958. This has given a substantial stimulus to the development of old city, Rawalpindi being very close to Islamabad, and growth in all parts of Rawalpindi city has been accelerated since the early 1960s. Development of the twin cities has now reached to the point where the urban areas merge together in places.

   Present population in Islamabad and Rawalpindi is 200,000 and 835,000 respectively. It is projected that population in the year 2000 will be 575,000 and 1,400,000 respectively, while an ultimate or saturation population in both the Masterplan areas will reach 1,000,000 and 1,700,000 respectively by the year 2030 or before.

The Khanpur Dam Project (which is under construction on Hero River by WAPDA) would be supplying 33 Mgd of water to Islamabad and 69 Mgd to Rawalpindi out of total reservoir yield of 180 Mgd. WAPDA has already completed Left Bank Canal for transmission of this water to Islamabad/Rawalpindi upto Nicholson Monument. Number of studies have been carried out for conduction of water from Nicholson Monument to Islamabad/Rawalpindi as well as for direct withdrawal from the reservoir and conduction through tunnels to the twin cities. A final plan has not been so far adopted and a least cost alternate has still to be agreed/accepted. The consultants would be required to recommend the least cost solution for conduction of water, and prepare detailed design etc.

II. General Terms and Reference.

2.1 - Part - I.

Feasibility for study of Khanpur Water Conveyance Project.

1. To update cost of various alternatives proposed for conduction of water from Khanpur to Islamabad/Rawalpindi.

2. To suggest and analyse other alternate routes with a view to determine most economical solution for conduction and utilization of water from Khanpur to Islamabad/Rawalpindi separately as well as combined basis.

3. To carryout preliminary design for the project including :-

i. Field survey and investigations in terms of topo-graphy geology and soil mechanics etc.

ii. Feasibility design of relevant facilities in terms of Civil and mechanical engineering inclusive of power transmission for electrical operations.

iii. Cost estimates of the project, operation and maintenance with breakdown of foreign and local currency cost.

iv. Preparation of implementation programme.

v. To make economical evaluation of the project.

Part - II.

Deatiled Designs, Cost Estimates and Tender Documents.

a. Prepare programme and supervise geo-technical investigations work including sub-soil and geo-logical investigations along finally approved alignment and structures.

b. Prepare detailed structural designs of project for the selected alternate including detailed drawings and designs report.

c. Prepare detailed estimates for the project.

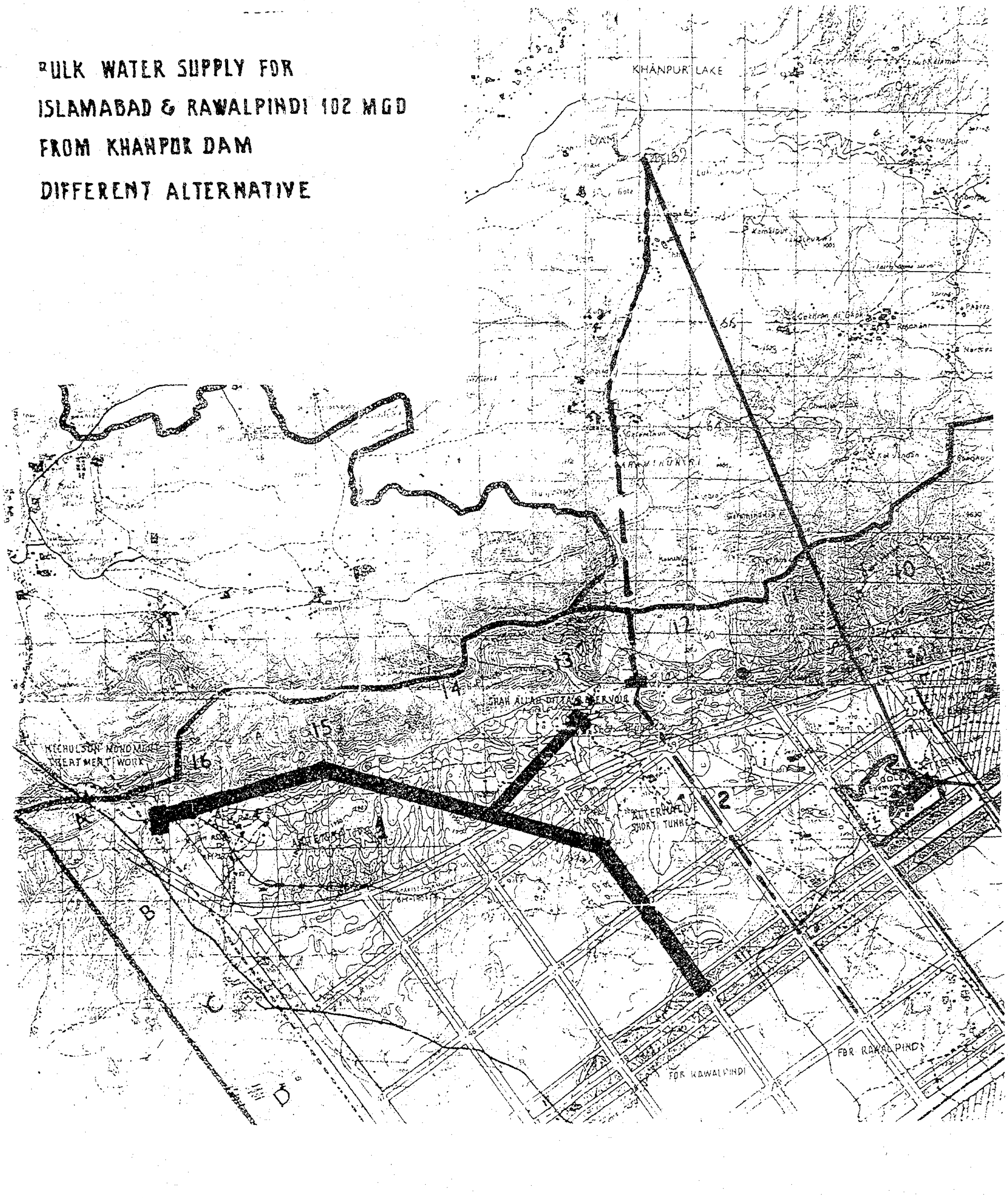
d. Prepare and submit tender documents including documents containing instructions to tenderers general conditions of contract.

II.3 - Part - 3.

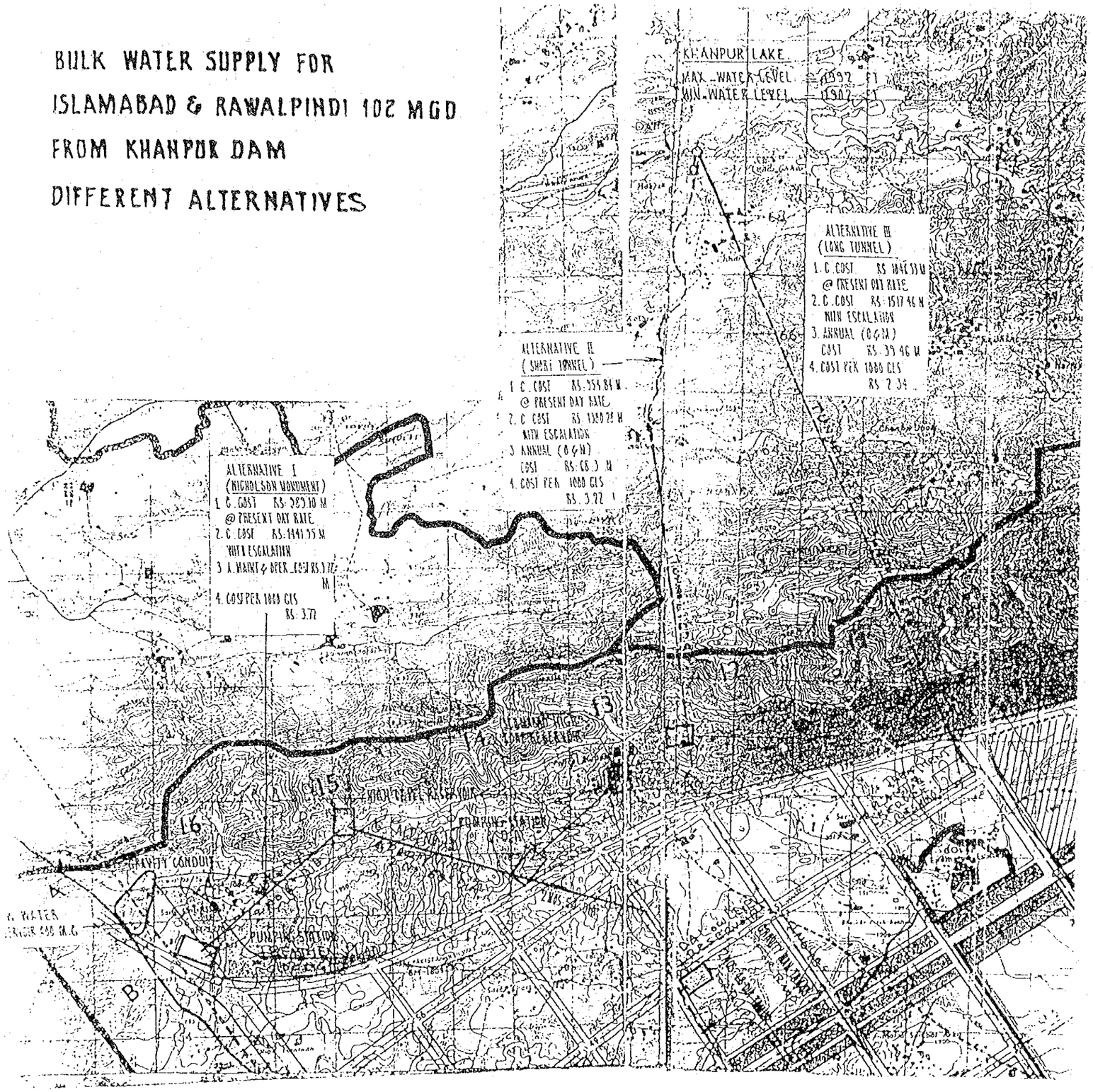
Financial Assistance for completion of the proposed Project.

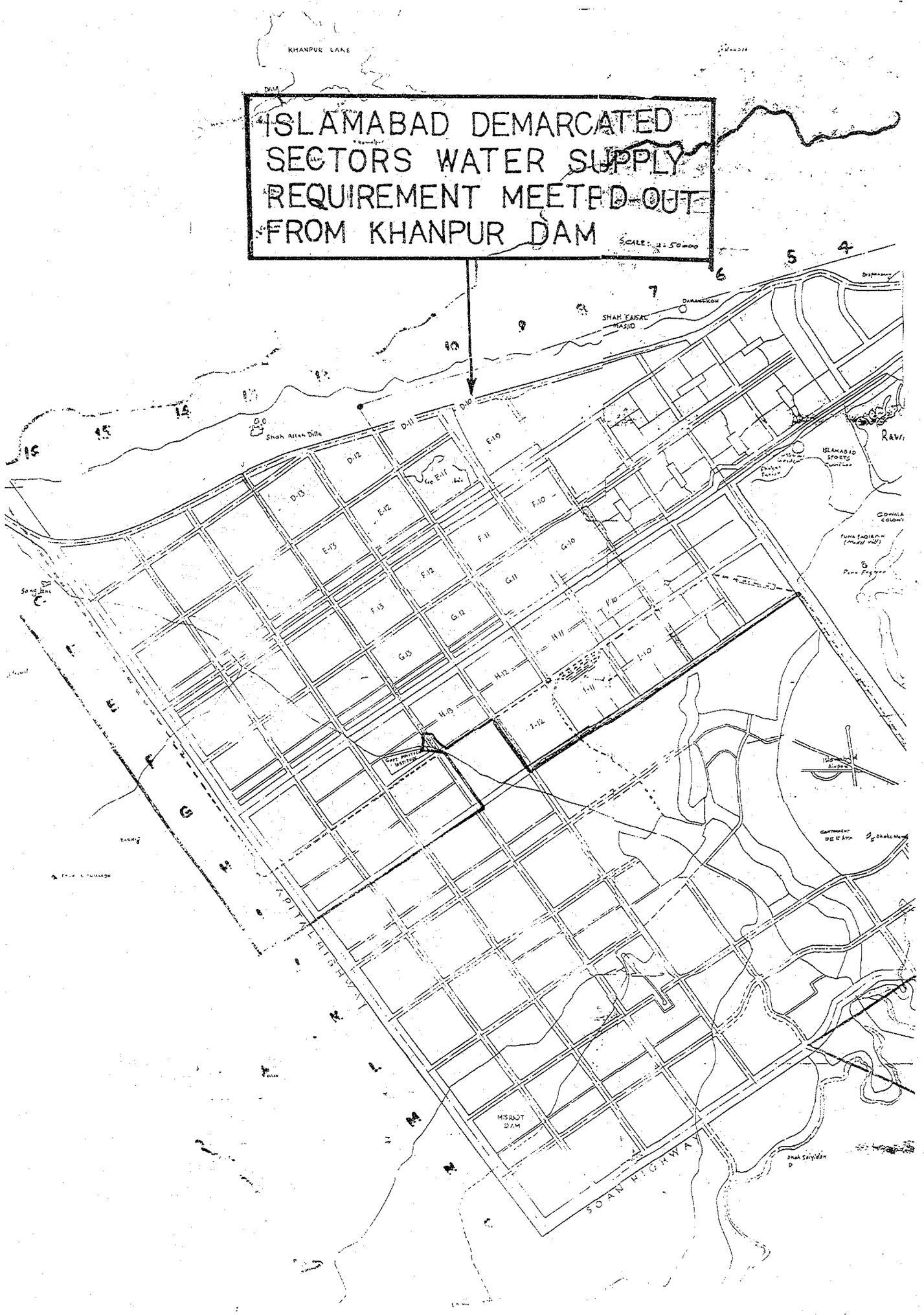
After the studies have been carried out the Japanese Government would be required to provide financial assistance for the import of machinery, equipment, pumps, pipes etc. for the completion of the project preferably as a grant.

BULK WATER SUPPLY FOR
ISLAMABAD & RAWALPINDI 102 MGD
FROM KHANPUR DAM
DIFFERENT ALTERNATIVE



BULK WATER SUPPLY FOR
ISLAMABAD & RAWALPINDI 102 MGD
FROM KHANPUR DAM
DIFFERENT ALTERNATIVES




ISLAMABAD DEMARCATED SECTORS WATER SUPPLY REQUIREMENT MEETED-OUT FROM KHANPUR DAM
SCALE: 1:50000
KHANPUR LAKE
DAM
SHAH FAISAL MASJID
Shah Allah Ditta
ISLAMABAD SPORTS COMPLEX
Pir Sohawa
MISRIOT DAM
GRAND TRUNK ROAD
MARGALLA HIGHWAY
SOAN HIGHWAY

GOVERNMENT OF PAKISTAN
PLANNING COMMISSION
PROFORMA FOR DEVELOPMENT PROJECT
FOR WATER AND SEWER PROJECTS

1. Name of work — Water Supply from Khanpur to Islamabad and Rawalpindi.

2. Authorities responsible for :-

i. Sponsoring. — Capital Development Authority.

ii. Execution. — Capital Development Authority.

iii. Operation & Maint:- — a. For Islamabad - C.D.A.
b. For Rawalpindi- Punjab Govt.
c. Cantt. - Defence Deptt.

3. Time required for the completion of the project:-

The project will be completed in four phases as per details given below :-

Phase.	Period	Water to be treated in M.G.D.		
		C.D.A.	Rwp.	Total
I.	1982-86	17	17	34
II.	1986-90	16	17	33
III.	1991-95	-	17	17
IV.	1996-2000	-	18.37	18.37
	Total:-	33	69.37	102.37

4. (a) Plan provision ;

i. If the project is included in the five years plan, specify actual allocation. — Yes, and also being included in 6th plan.

ii. If not included in the current plan, how is it now proposed

to be accommodated.(Inter/ Inter-sectoral adjustments in allocation or other resources may be indicated). -

iii. If the project is proposed to be financed out of block provision for a programme. -

Rs. in millions.

Total Block provision.	Amount already committed.	Amount proposed for this project.		Balance available.
		Altr.I	Altr-II	
-	-	1441.95	1380.28	
	C.D.A's share.	399.80	371.99	
	P.H.E.D's share.	1042.15	1008.29	

(b) If project is not in the plan, what warrants its inclusion in the plan. - Khanpur Dam is to be completed by June 1983. All beneficiaries have been directed by the government to take steps for utilizing the water of Khanpur Dam.

5. Relationship of the project with the objective of sector. Indicate the contribution of the project quantified if possible, to the targets in the five years plan and the names of other projects (whether sanctioned or under preparation) which would form part of an integrated programme within the sector. Supply of 33 M.G.D. water to Islamabad and 69.37 M.G.D. to R'Pindi.

6. Capital cost of project;

All figures in million.

Local Cost(Total).	Alternate-I	Alternate-II.
C.D.A. share.	311.35	295.63
P.H.E.D. share.	867.26	841.54

Foreign Exchange.		
C.D.A. share.	88.45	76.36
PHED's share.	174.89	166.75
Total:-	1441.95	1380.28
C.D.A's. Share.	399.80	371.99
PHED's share.	1042.15	1008.29
Total:-	1441.95	1380.28

7. Annual recurring expenditure after completion.

	Alternate-I.	Alternate-II.
Local cost.	75.21	64.36
Foreign Exchange.	6.00	4.00
Total:-	81.21	68.36
CDA's share.	26.30	22.11
PHED's share.	55.61	46.25
	81.21	68.36

8. Objection of the project preferably in quantitative terms.

To supply 33 Mgd water to Islamabad and 69.37 Mgd. to Rawalpindi and Cantt. from Khanpur source.

PRESCRIBED BY : NAME AND DESIGNATION.

CHECKED BY : NAME AND DESIGNATION.

APPROVED BY : NAME AND DESIGNATION.

Dated:

9. Location of the Project.

Attached as per plan map
Scale 1 : 1 mile.

10. Present facilities:

Give details of the present water supply and Sewerage arrangements in the area to be covered the present tariff structure and the income received during the last ten years should be given with details of the extent of non-recovery. The population income and social characteristic of the area should be given. Health statistics relating to morbidity due to unhiginic water supply should be mentioned and indicating of any schedule during the last 10 years.

Water for Islamabad will be used for Sectors in between 10 and 13 series. These sectors are at present under planning/ development of C.D.A. and none of these facilities at present are available. For Rawalpindi water is required to improve existing facilities which are in-adequate.

11. Description of Project.

Khanpur Dam originally conceived as an irrigation project was revised in 1973 and is now primarily a water supply project. The irrigation area has accordingly been reduced from 90,000 acres to 36,000 acres feet per year of water, 70% will be utilized for municipal and industrial purposes

and remaining 30% for irrigation. Réservoir designed to supply water for municipal and industrial purposes is to make supplies as follows :-

Rawalpindi	=	69.37 Mgd.
Islamabad	=	33.00 "
Other industries	=	28.50 "

For conveyance of this water WAPDA has constructed about 66,000 ft. long canal as left bank canal with its tail near Nicholson Monument. From R.D. 29,000 to its tail the canal is purely for water supply to Pakistan Ordinance Factory Wah, Rawalpindi and Islamabad. Considerations to feed Defence Complex at Wah, Industrial Compex at Taxila besides irrigation needs of the area motivated WPADA to route channel to its present alignment along the contours to facilitate gravity flow.

Maximum reservoir elevation at Khanpur Dam is 1962' while minimum pool level is 1902 ft. Out-let works have been designed for intake levels 1902' and 1923'. Invert level of left bank canal at tail is 1766 ft.

Capital Development Authority and Public Health Engineering Department Government of Punjab carried out independent studies through their consultants (M/s. Republic Engineering Corporation for C.D.A. and M/s. Allied Engineering Consultants for P.H.E.D. for treatment & conduction of water to the twin cities. These studies were for independent supplies to both the cities. M/s. Republic Engineering Corporation and M/s. Allied Engineering Consultants had considered withdrawal of water only from Nicholson Monument and then pumping it to Shah Allah Ditta in Sector C-13 for Islamabad and to Tomar reservoir alongwith the Railway Line for Rawalpindi.

C.D.A. was of the view that continuous pumping at higher heads would not only create maintenance problems but also is expensive solution in view of rising energy costs. M/s. NESPAK were accordingly appointed consultants by C.D.A. to recommend most economical alignment for conduction of water to Islamabad. M/s. NESPAK considered five alternates and recommended withdrawal of water directly from the lake and for its conduction to Islamabad through a short tunnel upto Shah Allah Ditta (a village in Sector C-13 of Islamabad (alternate - II).

In the meantime a firm of Canadian Consultants appointed by the Asian Development Bank for preparation of feasibility report for Rawalpindi recommended joint facilities for treatment, conduction and pumping of water to twin cities of Islamabad & Rawalpindi. These Consultants however had further recommended the defering of completion of Khanpur Dam to 1992 as in their view underground water in Rawalpindi should be first taped before utilization of water from Khanpur. These recommendations regarding defering of completion of Khanpur Dam were not fully accepted as the dam is not only required to supply water to Islamabad and Rawalpindi but also would supply water to other cities as well as for irrigation to NWFP and Punjab.

C.D.A. and PHED government of Punjab in the mean-time continued examining the matter for joint facilities and for determining the most economical alignment. These studies revealed that the joint facilities would not only be economical from capital cost point of view but also from operational & maintenance angle.

The Capital Development Authority Islamabad, and Punjab Government have accepted these proposals and have now agreed to have joint facilities for treatment, pumping and conduction of water to Islamabad & Rawalpindi.

Three alternate routes are available for conduction of water from Khanpur to Islamabad. These are ;

i. Nicholson Monument utilizing already completed canal to Shah Allah Ditta for Islamabad and to Tomar for Rawalpindi.

ii. Direct alignment from Khanpur Reservoir to Shah Allah Ditta through short tunnel.

iii. Direct from the reservoir through a long tunnel to Golra.

The 3rd route of long tunnel requires construction of 35,000 ft. long tunnel through Margalla Hills which would require specialized technique for the construction of tunnel. Cost estimates of this alternate have not been included in the present proposal but it is hoped that when detailed studies are carried out this alternate would also be considered as it would have very little power energy cost for pumping of water which factor would be an important one as the energy costs are expected to rise in the near future.

The remaining proposals are described here-under in more details alongwith the cost estimates and the capital cost and their operational and maintenance cost :-

I. Nicholson Monument Proposal.

Water at Nicholson Monument is available at RL 1766. It will be conducted through a RCC conduit which is 2500' long to a raw water reservoir capable of storing 5 day's supply. Water would then be treated and then pumped to a high level reservoir at RL 1980 through a short rising main. From this reservoir water would be supplied by gravity to Rawalpindi and lower zones of Islamabad. Pumping Station No. 2 is provided at the bifurcation point for supply of water to higher zones of Islamabad.

Capital cost of this proposal is Rs.1041.95 millions with annual operational and maint. cost at Rs. 81.91 millions. The cost of production of water would be about Rs.3.72 per/1000 gallons. This does not include any interest on investment as it is considered to be public utility project and no interest has been taken.

II. Short Tunnel Route through Margalla Hills.

According to this proposal water is directly drawn from Khanpur Reservoir through intake tower. The raw water is pumped to a short rising main upto RL 2132 from where it is directly conducted to Islamabad and R'Pindi initially through RCC conduit 17000 ft. long and then through a horse shoe tunnel 8' dia 16,000 ft. long. It is filtered in the treatment plant near Village Shah Allah Ditta on the southern slopes of Margalla Hills in Sector C-13. After treatment water would be conducted to Rawalpindi by gravity through 2 Nos. 48" dia pipes upto Tomar. 80% supplies to Islamabad

would be by gravity but for higher sectors it would be pumped to a high altitude reservoir in Sector E-13 at RL 2100.

The capital cost of proposal is Rs.1380.28 millions with annual operational and maint. cost at Rs. 68.36 millions. Cost of water per 1000 gallons would be Rs. 3.22.

Thr project has been divided into 4 phases for completion in its entirity upto year 2000. The C.D.A. portion of the project would be completed upto 1990 and has been divided into 2 phases. The Rawalpindi portion would continue to be constructed and developed beyond 1990.

Final alignment would however be decided after detailed studies are carried out by the Consultants.

12. Give date when capital expenditure estimates were prepared.

November 1982.

13. Break down of the capital cost covering the whole of the investment period as indicated below :-

(a) Water Supply System.

i. Source.
ii. Treatment Plant.
iii. Conduction.
iv. Storage.
v. Distribution.

(b) Cost of Land.

a. Cost of acquisition of Land (included)

For detail see Appendix"A"

b. Cost of land development (included).
c. Interest during construction
d. Work charged establishment.
e. Contingencies
f. Departmental charges.
g. Transport & Vehicles.

14. Basis of Cost of Estimate.

Number of studies have been carried out in the past at different times. The rates taken in the PC.1 have been derived from these studies and have been agreed by the Planning and Development Department, Government of Punjab. A brief note as to how the unit rates have been worked out is attached at Appendix-"B".

15 Estimates and Annual Maintenance After completion.

i.	Salaries of Staff.	As attached at Annexure-"E".
ii.	Consumeable stores.	
iii.	Contingent Staff.	
iv.	Other contingencies.	

16. Give unit costs for each category of out put e.g. cost per 1000 gallons of water supplied :-

Cost per 1000 gallons.	Alter.I.	Alter.II
	3.72	3.22

(See Annexure "D" for details).

17. (a) Give expected income statement (profit and loss accounts) for 10 years or until normal capacity is reached. Rate of depreciation and the salvage value of property should be given. The basis for tariffs should be indicated. Income from each source (e.g. from sale of sullage should be given).

The cost of production of water as worked out at Annex "C" is Rs. 3.72 per 1000 gallons in case of Alternate-I and Rs. 3.22 per 1000 gallons in case of Alternate-II.

At present C.D.A. is charging Rs.3/- per 1000 gallons for the domestic use and Rs.5/- per 1000 gallons for commercial & Industrial use. On average rate of Rs. 4/- this project will give profit as given below as per detail given at Annexure "G".

	Alternate-I.	Alternate-II.
After completion phase - I, 1986.	Rs. 34,74,800/-	Rs. 96,79,800/-
After completion phase -II, 1990.	Rs. 68,47,400/-	Rs. 1,90,74,900/-
After completion Phase -III, 1995.	Rs. 85,84,800/-	Rs. 2,39,14,800/-
After Completion Phase -IV, 2000.	Rs.1,04,24,400/-	Rs. 2,90,39,400/-

(b) Revenue per unit at existing and proposed tariff :-

Existing	i. Domestic	= Rs. 3/- per 1000 gallons.
	ii. Commercial & Industrial	= Rs. 5/- per 1000 gallons.
Proposed	a. Domestic	= Rs. 4/- per 1000 gallons.
	b. Commercial & Industrial.	= Rs. 6/- per 1000 gallons.

18. Give a statement showing phasing of repayment of loans. Indicate debt servicing capacity (i) of project, (ii) of loan receiving organization.

This project is expected to be completed out of Government Grant and as such no debt receiving is involved.

19. Annual phasing of physical work and financial requirements for the subject (attached pert or bar diagrams if prepared).

The detail of phasing are given in the Annexure attached alongwith the financial requirements. It is proposed to complete the project in four phases, however transmission lines will be completed in two phases. The entire work is expected to be completed in year 2000 and Ist phase will be completed in June 1986.

20. Foreign Exchange Expenditure.

	Altr. I.	Altr. II.
Phases ;		
Ist Phase.	See Annexure "D" attached for details.	
2nd Phase.		
3rd Phase.		
4th Phase.		

21. (a) Likely sources and amount of Foreign Exchange cost of the Project. — Government Grant/ Japanese Grant.

(b) Present position regarding availability commitment or negotiation. — Government of Japan has shown interest to finance the Project. This source is required to be tapped.

22. Indicate source and amount of rupee component of project. — Being a grant-in-aid work funds will be allocated by the government.

PART-C PROJECT REQUIREMENTS.

23. (a) MANPOWER.

		For Execution Man month.	For operation number.
1.	Professional & Technical.	200x12x17 = 40,800	29
2.	Administrative, Executive and Managerial.	20x12x17 = 4,800	4
3.	Clarical.	200x12x17 = 40,800	20
4.	Sales	N.A.	-
5.	Service.	N.A.	-
6.	Skilled.	200x12x17	150
7.	Unskilled.	2000x12x17	
8.	Others.	100x12x17	

(b) Likely shortage of manpower by occupation. — Nil

(c) Steps to be taken to assure availability of manpower. — Manpower will be available.

(d) Approximate No. of persons required to be trained per year (locally and abroad) and the kind of skills to be learnt. — At least 16 persons are required to be trained in following fields :-

a. Water treatment.
b. Water quality control.
c. Tunnel construction
d. operation of machinery.

(e) Give total capital outlay, give the capital cost of mobilizing the worker for one shift. — NIL.

24. Physical and other facilities required for project :-

Items.	Total.	To be provided from the project itself	To be provided from the public utility
1.	2.	3.	4.
(a) Access Road. (b) Fuel & power. (c) Public Health requirements.	Yes. To be provided from the project itself.		

(d) Housing by type.

F - 6 Nos.
E - 22 "
D - 16 "
C - 14 "
B - 20 "
A - 60 "

4 Nos. (Bachelor Hostel & accommodation for works)

@%. Materials, supplies and equipment requirements.

A.1. Minimum total requirements for execution to be completed only for major items costing more than 10% of the total cost.

(All figures in million)

Item.	Description.	Cost.	
		Local	Foreign Exch.
1.	Materials.		
	a. Steel.	Rs. 100.00	-
	b. Cement.	Rs. 100.00	-
2.	Supplies & Spares.		
	Spare parts of the Machinery.	Rs. 50.00	
3.	Equipment & Machinery.		
	a. Treatment plant.	Rs. 170.00	Rs. 85.00
	b. Suction & Delivery pipes.	Rs. 0.87	Rs. 0.43
	c. Pumping Station.	Rs. 60.00	Rs. 30.00
	d. Tunnel equipment.	Rs. 10.00	Rs. 10.00
	e. Compressors.	Rs. 20.00	Rs. 10.00
	f. Cranes.	Rs. 10.00	Rs. 5.00
	g. Drilling equipment.	Rs. 10.00	Rs. 5.00
	h. F.E. loaders.	Rs. 25.00	Rs. 15.00
	i. Trollies & Hills.	Rs. 25.00	Rs. 15.00

A.II. Materials, spares and supplies and equipment for operation of project. :-

Unit.		Local			Foreign		
		Qty.	Rate.	Cost.	Qty.	Rate	Cost.
1.	Material.						
	a. Alum.						
	b. Chlorine.	L. Sum					
	c. Bleaching Powder & other chemicals.	Rs. 25.00 million			Nil		
	d. Sand.						

2. Supplies & Spares.

i.	Spare parts for pumping Station and Filteration Plant.	Rs. 4.00 million.	Rs. 2.00 mil.
ii.	Pumps & Pipes.	Rs. 1.00 "	Rs. 0.5 mil.

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26. In the case of imported material and equipment for Execution, indicate :-

a.	Justification for imports.	Only those items will be imported which are not locally manufactured.
b.	Proposed source/ source supply.	Government of Japan has shown interest to finance the project. This source is required to be tapped.

COST ESTIMATES - ALTERNATIVE-I (NICHOLSON MONUMENT).

S.N.	Description of Items.	Total Cost of the Project				Ist Phase.		2nd Phase.		3rd Phase.		4th Phase.	
		Rates	Total cost	C.D.A.	Rwp	C.D.A.	Rwp.	C.D.A.	Rwp	C.D.A.	Rwp.	C.D.A	Rwp
1.	RCC Feeder Conduit 3300' from tunnel to Raw Water reservoir.	Rs.10000/ft.	33.00	10.67	22.33	10.67	22.33	-	-	-	-	-	-
2.	Raw . water Reservoir 600 mg.	" 0.1/gl.	60.00	19.41	40.59	19.41	40.59	-	-	-	-	-	-
3.	Treatment plant 107 Mgd.	" 2.5 m/mgd.	255.00	82.50	172.50	41.25	43.125	41.25	43.125	-	43.125	-	43.125
4.	Suction pipe 60" dia 2 Nos. 300' each.	" 2200/ft.	1.30	0.42	0.88	0.42	0.44	-	-	-	0.44	-	-
5.	Pumping Station No.1 150 Mgd.	" 0.6 M/mgd.	90.00	29.12	60.88	14.56	15.22	14.56	15.22	-	15.22	-	15.22
6.	Delivery pipe 60" dia 5000x2 lines. (Ductile C.I.)	" 3500/ft.	35.00	11.32	23.68	11.32	11.84	-	-	-	11.84	-	-
7.	Discharge tank 2.5 Mg.	" 3.0 M/mgd.	7.50	2.42	5.08	2.42	2.54	-	2.540	-	-	-	-
8.	Gravity pipe 2 lines (PRCC or M.S.) (a)*	" 2500/ft.	52.50	16.98	35.52	16.98	17.76	-	-	-	17.76	-	-
	(a)* 10,500 Rft.60" dia.	" 2300/ft.	69.00	22.32	46.68	22.32	23.34	-	-	-	23.34	-	-
	(b) 15,000 Rft.54" "	" 2000/ft.	84.00	-	84.00	-	42.00	-	-	-	42.00	-	-
	(c) 21,000 Rft.48" "												
9.	Addl. Cost for tunnel/ deep cut for passing Golra ridge - 4000 ft.	" 7000/ft.	28.00	-	28.00	-	28.00	-	-	-	-	-	-
			715.30	195.15	520.15	139.35	236.185	55.81	63.425	-	153.725	-	58.345

APPENDIX-A

S.No.	Description of Irems.	Total Cost of the Project.				Ist Phase.		2nd Phase.		3rd Phase.		4th Phase.	
		Rates	Total Cost	C.D.A.	Rwp.	C.D.A.	Rwp	C.D.A.	Rwp.	C.D.A	Rwp	C.D.A	Rwp.
10.	Pumping Station No.2, 30 Mgd. for higher areas.	Rs. 0.5 M/mgd.	15.00	15.00	-	15.00	-	-	-	-	-	-	-
11.	Delivery pipe 36" dia (Ductile C.I). 8000 Rft. from pumping station No.2 to Shah Attal Ditta eservoirs.	Rs. 1500/ft.	12.00	12.00	-	6.00	-	6.00	-	-	-	-	-
12.	Shah Allah Ditta Reservoir 6 Mg. for CDA Higher zones.	Rs. 3/gl.	18.00	18.00	-	9.00	-	9.00	-	-	-	-	-
13.	Golra Service Reservoir 5 Mg.(for CDA lower zones)	" 3/gl.	15.00	15.00	-	7.50	-	7.50	-	-	-	-	-
14.	Tomar Service Reservoir 20.8 Mg. for R'Pindi.	Rs. 3/mg.	62.40	-	62.40	-	15.60	-	15.60	-	15.60	-	15.60
15.	Cost of Land.	Rs. L.Sum.	10.00	3.24	6.76	3.24	6.76	-	-	-	-	-	-
16.	Grid Station	Rs. L.Sum.	6.25	2.02	4.23	2.02	4.23	-	-	-	-	-	-
17.	Roads 9 Miles.	Rs. L.Sum.	6.30	2.04	4.26	2.04	4.26	-	-	-	-	-	-
	Total:-		860.09	262.45	597.64	184.15	277.995	78.31	76.445	-	169.285	-	73.905
	Add 15% Consultants fee, departmental charges, supervision charges, transport charges, contingencies & unforeseen Items.		129.01	39.37	89.65	27.62	41.700	11.75	11.467	-	25.392	-	11.086
			989.10	301.82	687.29	211.77	319.695	90.06	87.912	-	194.677	-	84.991
	Add escalation 25% on Ist phase, 50% on 2nd phase, 75% on 3rd phase and 100% on 4th phase.					52.94	79.924	45.30	43.956	-	146.08	-	84.991
						264.10	399.619	135.090	131.368	-	340.685	-	169.982

COST ESTIMATE - ALTERNATIVE - II. (Short Tunnel)

.No.	Description of Items.	Total Cost of the Project.				Ist Phase.		2nd Phase.		3rd Phase		4th Phase.	
		Rates.	Total Cost	C.D.A	Rwp.	C.D.A.	Rwp	C.D.A.	Rwp	C.D.A.	Rwp	C.D.A.	Rwp.
1.	Intake at Dam including gates & bridges.	Rs. 6.00	6.00	1.94	4.06	1.94	4.06	-	-	-	-	-	-
2.	Intake tunnel 830' long, 8½' high.	" 10000/ft.	8.30	2.69	5.61	2.69	5.61	-	-	-	-	-	-
3.	Suction pipe 60" dia 2 Nos. 300' each.	" 2200/ft.	1.30	0.42	0.88	0.42	0.44	-	-	-	0.44	-	-
4.	Pumping Machinery 150 Mgd.	" 0.6/Mgd.	90.00	29.12	60.88	14.56	15.22	14.56	15.22	-	15.22	-	15.22
5.	Pipes 60" dia,2 Nos. 2500' each.	" 5000/ft.	25.00	8.09	16.91	4.04	4.23	4.04	4.23	-	4.23	-	4.23
6.	Gravity conduit, 13600' 60" dia (PRCC or M.S)	" 3000/ft.	40.80	13.20	27.60	13.20	27.60	-	-	-	-	-	-
7.	Tunnel 16280' 8½' high.	" 10000/ft.	162.80	52.67	110.13	52.67	110.13	-	-	-	-	-	-
8.	Treatment works 102 Mgd.	" 2.5 m/mgd.	255.00	82.50	172.50	41.25	43.13	41.25	43.13	-	43.12	-	43.12
9.	Service Reservoirs 20 Mg. (Shah Aliah Ditta 6 Mg. + high zone 5 Mg.)	" 3/gal.	33.00	33.00	-	16.50	-	16.50	-	-	-	-	-
			622.20	223.63	398.57	147.27	210.42	76.35	62.58	-	63.01	-	62.57

APPENDIX-A

ALTERNATIVE-II

S.No.	Description of Items.	Total Cost of the Project.				1st Phase.		2nd Phase		3rd Phase.		4th Phase.	
		Rates.	Total Cost	C.D.A.	Rwp.	C.D.A.	Rwp	C.D.A.	Rwp.	C.D.A	Rwp	C.D.A	Rwp
10.	Gravity flow from Shah Allah Ditta twin lines 30,000' each 48" dia.	Rs.2000/ft.	120.00	-	120.00	.-	60.00	-	-	-	60.00	-	.-
11.	Tomar Reservoir 20.8 mg."		62.40	-	62.40	-	31.20	-	-	-	31.20	-	-
12.	Land.	"	7.50	2.43	5.07	2.43	5.07	-	-	-	-	-	-
13.	Grid Station.		2.00	0.65	1.35	0.65	1.35	-	-	-	-	-	-
14.	Road, 3 miles.		1.20	0.39	0.81	0.39	0.81	-	-	-	-	-	-
15.	Pumping Station, Rising Mains etc. for Islamabad high zone.		15.00	15.00	-	7.50	-	7.50	-	-	-	-	-
		Total:-	830.301	242.10	588.20	158.24	308.85	83.85	62.58	-	154.21	-	62.57
	Add 15% Consultation fee, departmental charges, supervision charges, transport charges and contingencies.		124.54	36.31	88.23	23.73	46.32	12.57	9.38	-	23.13	-	9.38
			954.84	278.41	676.43	181.97	355.17	96.42	71.98	-	177.35	-	71.95
	Escalation ;												
	25% Ist Phase.					45.49	88.79						
	50% 2nd Phase.							48.21	35.99				
	75% 3rd phase.									-	133.01		
	100% 4th Phase.											-	71.95
		Total:-	-	-	-	227.46	445.96	144.63	107.97	-	310.36	-	143.90

LONG TUNNEL PROPOSAL - ALTERNATE-III.

S.No.	I T E M S.	Rate Rs.	Cost(Million Rs.)
1.	Intake tower at Dam including gates and bridges.	Rs. 6.00	6.00
2.	Intake pressure tunnel 870', 8½' dia.	" 10,000/ft.	8.70
3.	RCC pressure conduit 1500 ft.	" 4,000/ft.	6.00
4.	Tunnel 36,450', 8½' high.	" 10,000/ft.	364.50
5.	Treatment works, 102 Mgd.	" 2.5 m/Mgd.	255.00
6.	Suction pipes, 3' dia 300'.	" 1100/ft.	0.33
7.	Pumping Station for CDA (20x15) = 30 Mgd.	" 0.5 m/Mgd.	15.00
8.	Transmission pipes 2 Nos.36" dia, for CDA - High pressure zones, 7200 ft. long.	" 1500/ft.	21.60
9.	Service Reservoirs: 1. Islamabad=11.00 Mgd. 2. Rawalpindi=20.8 Mgd.	" 3/gal.	65.[illegible]

S.No.	I T E M S.	Rate Rs.	Cost (Million Rs.)
10.	Gravity conduit, 31,700', 48" dia twin lines	2000/ft.	126.80
11.	Land.		7.50
12.	Grid Station.		2.00
13.	Road 3 mile.		1.20
			910.03
	Add 15% Consultation fee, departmental charges, supervision charges, transport charges and contingencies.		136.50
	Escalation :-	Total:-	1046.53
	25% Ist phase. 50% 2nd phase. 75% 3rd phase. 100% 4th phase.		470.93
		Grand Total:-	1517.46

Appendix " B "

UNIT RATE BASIS.

1. Treatment Works.

Basis for estimates are as below :-

a. M/s. NESPAK,in their feasibility report for Khanpur water conveyance, have estimated cost of 60 Mgd., Plant as Rs. 116.50 millions (1980-81 prices).

b. M/s. AESL (Canadian Consultants) based their cost on the formula ;
C = 1.17 Q 0.81 where C = Capital Cost in million Rs., Q = designed output in MLD.

Cost for 30 Mgd = Rs. 63.00 million.
For 60 Mgd = Rs. 110.00 million.

A uniform price at Rs. 2.50 millions per Mgd. has been taken in the PC.1 which also takes care of escalation from 1980 onwards.

2. Service Reservoir.

It will be at ground level & constructed in RCC. Basis for unit rate are :-

i. Public Health Engineering Department,Govt. of Punjab, has kept a record of the costs of existing large reservoirs in Rawalpindi area. P.H.E.D. Rawalpindi has intimated that in 1981, cost was coming out to be Rs. 2.50/gallon.

ii. M/s. National Engineering Services of Pak (NESPAK) used a figure of Rs. 2/gallon.

iii. C.D.A. has also completed number of reservoirs At present one reservoir of 1 M.G. capacity at Shakarparian is under construction, cost .

of this reservoir per gallon is Rs. 2.5 per gallons.

For purposes of PC.1 & comparison of cost, uniform price of 3/gallon has been used.

3. Mild Steel/Ductile Iron/RCC Pipe.

a. M/s. ESPAK (after enquiring from HMC, Taxila and market) for steel pipes, adopted a uniform rate of Rs. 9/lb. or ;

Dia	Cost/ft.
(3') 900 mm.	Rs. 1000/-
(4')1200 mm.	Rs. 1800/-
(4½')1350 mm.	Rs. 2150/-
(5') 1500 mm.	Rs. 2400/-

We have rounded these to Rs. 2000/- for 48"/Rs. 2300/- for 54" & Rs. 2500/- for 60" dia. Prices for PRCC pipes have been taken to be almost the same.

b. Ductile iron pipe (60" dia) rate has been enquired from the market to be Rs.3500/ft.

Annual Operational & Maintenance cost as per local and international practice has been taken to be 1.5% of capital cost.

4. Pumping Stations:

i. In 1980, M/s. AESL adopted the following equation for about 350' head to be pumped. Capital cost included construction and installation of plants and equipment.

Capital Cost C = 0.414 x Q (.634) million.
Where Q = designed peak output in MLD.

For 60 Mgd. cost was Rs. 19.2 million. Taking inflation into view, we have adopted Rs. 0.6

million/Mgd, as the unit price for about 380' head and Rs. 0.5 M/Mgd for 300' head and Rs. 0.4 M/Mgd for 250' head.

ii. Annual O & M cost as per local & international practice has been taken to be 6.5% of capital cost.

5. Tunnel 8½' high, Horse-shoe X-Section.

Tunnel construction is one of the most costly as well as most hazardous of all project components. Cost of tunnel is directly affected by geological formation along the route of tunnel, position of water table and length of tunnel. Lengths of tunnel encountered in the present study are 16,280' and 36,450 ft.

Basis for unit cost adopted are as under :-

a. Out of various tunnels constructed for Khanpur Dam Project, longest tunnel is Right Bank Canal Tunnel having 6' high horse-shoe X-section. Construction of tunnel started in 1973 and was completed in 1977. Total length of tunnel is 9,250'. Completion cost of tunnel was Rs. 281,73,994 which comes out to about Rs. 3050/ft.

b. M/s. AESL, Canadian Consultants, in their final report submitted in Aug: 1980 used a rate of Rs. 6,000/ft. for a 7' high tunnel of about 15000' length.

c. As proposed tunnel is 8½' high, and very long, we have assumed a rate of Rs. 10,000/ft. which is also in keeping with the international rates for such works in U.S.A. and Japan.

6. Operational & Maintenance Cost for Treatment Cost.

i. O & M cost of treatment plant at Rawal Dam operated by Public Health Engineering Deptt:

Govt. of Punjab, Rawalpindi works out to about Rs. 5.3 million which is about 12% of capital cost.

ii. Design Office, WAPDA, in their study has recommended 12% of capital cost as yearly operational & maintenance cost.

In this study 12% has been taken as the O & M cost of treatment plant.

APPENDIX - C

ALTERNATIVE- I

Capital Cost of the Project = Rs.1,44,19,50,000/-

I. Production Cost (Per Annum).

Ownership Cost.

Depreciation Cost(based on 50 years average life). = Rs. 2,88,39,000/-

II. OPerational Cost. = Rs. 8,19,10,000/-

Total:- = Rs. 11,07,49,000/-

III. Annual production (estimated).

= 102 x 365 = Rs. 37230 Mgd.

Less wastages 20% and leakages. (-) = Rs. 7,446/-

Net Annual Production of water. = Rs.

Per Mgd. Rate = $\frac{11,07,49,000}{29,767}$ = Rs. 3,720/-

per 1000 gallons rate = Rs. 3.72

Operational & Maintenance cost of Alternative-I.

APPENDIX-C

S.No.	I T E M	Rate	Cost (in mil.Rs.)
1.	Treatment works		30.60
2.	Pumping Machinery, Pipes etc.		11.59
3.	Civil Works.		0.20
4.	Electricity for pumps.		39.52
	Total:		81.91

ELECTRIC CONSUMPTION

APPENDIX- C

1. Alternative - I (From Nicholson Monument).

Head : Nicholson Monument. - 1730'

Discharge Tank. - 1980'

250'

Friction Losses. $= \frac{0.00034 \times 5000 \times (3.5)^2}{5} = 4.16 = 4.5$ ft.

Losses due to fitting = 5.00 ft.

Total head = 250+4.5+5 = 259.50 = 260'

Q = 102 Mgd. = 70833 gpm

H.P. $= \frac{70833 \times 260}{3300 \times 0.7}$ = 8.07 B.H.P. Say 80.10

Electric Consumption =

8010 x 23x0.746 x 365x0.7 = 35.115 million.

ii) Head = 110 ft.

Q = 30 Mgd. = 20833 gpm.

H.P. - $\frac{20833 \times 110}{3300 \times 0.7}$ = 1000 B.H.P.

Electric Consumption = 1000x23.0.746x365x0.7

= 4.40 million.

Total: = 35.115 + 4.400

= 39.515. Say = 39.52

Capital Cost of the Project = Rs. 1,38,02,80,000/-

I. Production Cost (Per Annum)

Ownership Cost.

Depreciation Cost (based on 50 years average life). = Rs. 2,76,05,600/-

II. Operational Cost. = Rs. 6,83,60,000/-

Total: = Rs.9,50,65,600/-

III. Annual production(Estimated)

= 102 x 365 = Rs. 37230 Mgd.

Less 20% wastages and leakages. (-) = Rs. 7446

Net annual production = Rs. 29797/-

Per Mgd. rate. $\frac{9,59,65,600}{29787}$ = Rs. 3221.72

Per 1000 gallons rate = Rs. 3.22

Operational & Maintenance cost
Short tunnel (Alternative-II).

S.No.	I T E M	Rate Rs.	Cost (Mil.Rs.)
1.	Treatment Works.		30.60
2.	Pumping Machinery, Pipes etc.		6.16
3.	Civil Works.		0.20
4.	Electricity charges.		31.40
		Total:	68.36

2. SHORT TUNNEL PROPOSAL (ALTERNATIVE-II)

Head = At Dam 1895'
(Intake structure)

At Chhoi
Plateau 2132'

237' + (3' Friction loss)
= 240 ft.

Q. = 102 Mgd. = 70,833 gpm.

$$BHP = \frac{70833' \times 240'}{3300 \times 0.7} = 7200 \text{ H.P.}$$

Electric Consumption ;

= 7200 x 23 x 0.746 x 365 x 0.7

= 31.40 million.

FOREIGN EXCHANGE FOR ALTERNATIVE - I. APPENDIX- D

S.No.	Description of Items.	C.D.A.	Rawalpindi.
1.	Treatment plant102 Mgd.	27.22	56.92
2.	Sunction pipe 60" dia 2 Nos. 300 each.	0.29	0.616
3.	Pumping Station No.1 150 Mgd.	20.37	42.62
4.	Delivery pipe 60" dia 5000x2 lines.	7.92	16.57
5.	Gravity pipe 2 lines		
	a. 10500 Rft. 60" dia	5.94	12.43
	b. 15000 running ft.54" dia.	7.81	16.33
	c. 21000 Rft. 48" dia.	-	29.40
6.	Pumping station No.2. 30 Mgd.	10.50	-
7.	Delivery pipe 36" dia 8000 Rft. from Pumping station No. 2 to Shah Allah Ditta Reservoirs.	8.40	-
		88.450	174.886

APPENDIX-D

FOREIGN EXCHANGE FOR ALTERNATIVE - II.

S.No.	Description of Item.	C.D.A.	Rawalpindi.
1.	2	3.	4.
1.	Sunction pipe 60" dia 2 Nos. 300' each.	0.29	0.616
2.	Pumping machinery 150 Mgd.	20.37	42.62
3.	Pipes 60" dia (Ductile C.I.) 2 Nos. 2500' each.	2.83	5.91
4.	Gravity conduit pipe 13600', 60" dia. (M.S., PRCC or D.C.I.)	4.62	9.66
5.	Tunnel 16280' 8½' high	10.53	22.02
6.	Treatment works 102 Mgd 2 mil/Mgd.	27.22.	56.92
7.	Gravity flow from Shah Allah Ditta Twin line 30,000' each. (48" dia).	-	29..00
8.	Pumping station rising main etc. for Islamabad high zones.	10.50	-
		76.36	166..75

ALTERNATIVE-I APPENDIX'G'

a. $\frac{34000000 \times 0.28 \times 365}{1000}$ = 34,74,800/00

b. $\frac{67000000 \times 0.28 \times 365}{1000}$ = 67,47,400/00

c. $\frac{84000000 \times 0.28 \times 365}{1000}$ = 85,84,800/00

d. $\frac{102000000 \times 0.28 \times 365}{1000}$ =1,04,24,400/00

ALTERNATIVE-II

a. $\frac{34000000 \times 0.78 \times 365}{1000}$ = 96,79,800/00

b. $\frac{67000000 \times 0.78 \times 365}{1000}$ =1,90,74,900/00

c. $\frac{84000000 \times 0.78 \times 365}{1000}$ =2,39,14,800/00

d. $\frac{102000000 \times 0.78 \times 365}{1000}$ =2,90,39,400/00

DETAILS OF MANPOWER.

(i)	Professional and Technical Staff.	Operational	For Execution
a.	Chief Engineer/ Project Director.	1	-
b.	S.E.	2	-
c.	XEN	7	1
d.	S.D.O.	21	3
e.	Sub.Engineer.	62	10
f.	Foreman Grade-I.	10	5
g.	Foreman Grade-II.	15	
h.	Surveyor.	15	2
i.	Mechanic.	15	-
j.	Electrician.	15	-
k.	Driver.	37	-
		200	21

(ii)	Administrative, Executive and Managerial.		
i.	Administrative Officer.	2	1
ii.	Financial Officer.	3	1
iii.	Planning Officer.	14	1
iv.	Secretary.	1	1
		20	4

(iii)	Clarical.		
a.	Assistant Admin: Officer.	20	1
b.	Superintendent.	20	1
c.	Assistants.	60	2
d.	U.D.Cs.	55	6
e.	L.D.Cs.	45	10
		200	20

i. Salaries of Staff

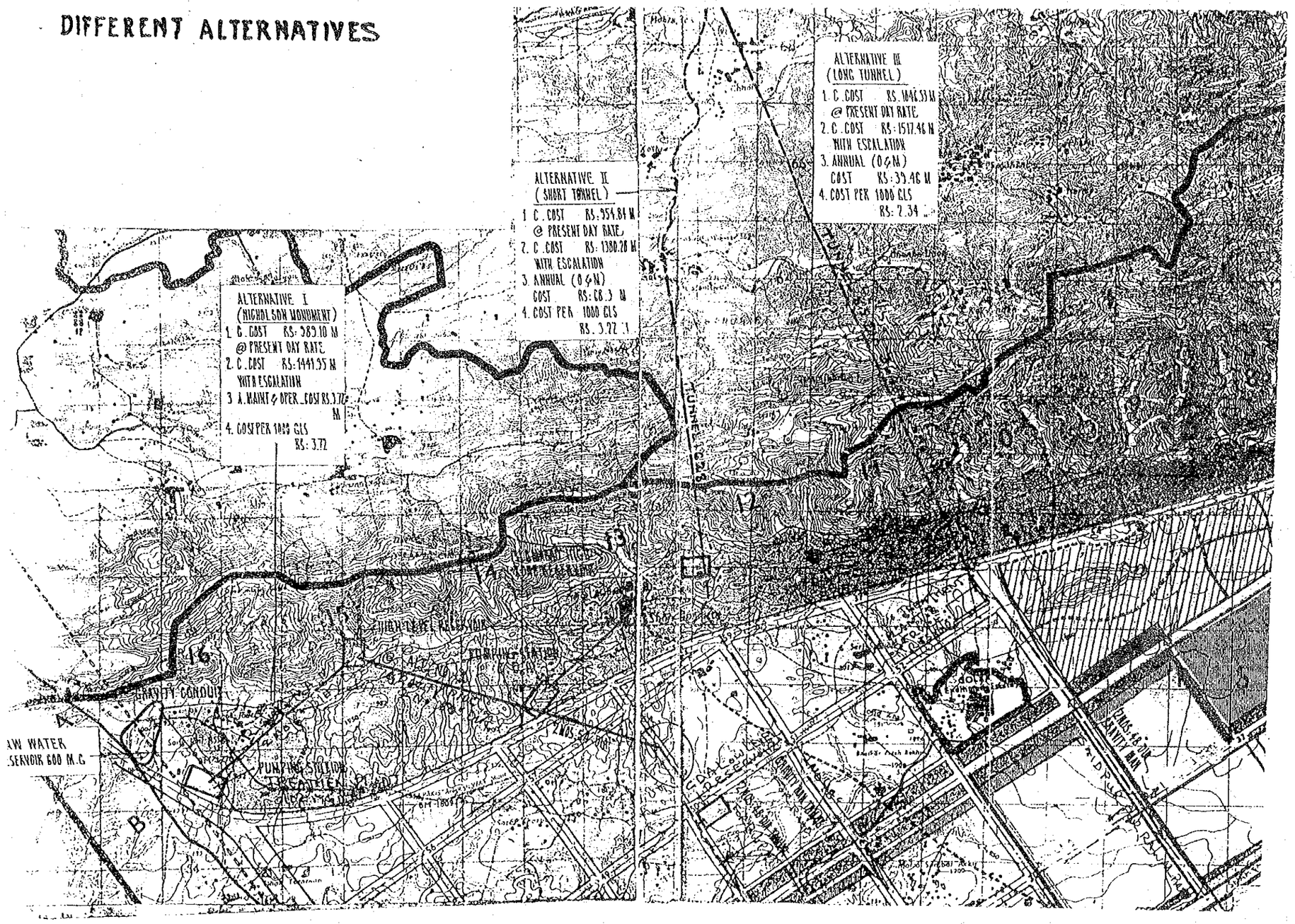
a.	XEN	3000/-x12x1	= Rs. 36,000/-
b.	S.D.O.	2000/-x12x3	= Rs. 72,000/-
c.	Sub.Engr.	1200/-x12x10	= Rs.1,44,000/-
d.	Foreman	1000/-x12x5	= Rs. 60,000/-
e.	Surveyor	900/-x12x2	= Rs. 21,600/-
			= Rs.3,33,600/-

ii. Consumeable Stores.

a.	Alum	15.00 lacs.
b.	Chlorine.	
c.	Bleaching Powder & other chemicals.	
d.	Sand.	

iii.	Contigent Staff	L.S.	4.00 Lacs.
iv.	Contingencies.	L.S.	2 Lacs.
		Total_	Rs.24,33,600/-

DIFFERENT ALTERNATIVES



質問状に対する回答

1－5－2　パ政府への質問事項

1. 資料の有無

(1) Khanpur ダム流域の降水量データ

観測所の位置，観測期間

(2) Hero R.の Khanpur ダム地点または近傍における流出量データ

(3) プロジェクト関連地域の地形図の存在状況

カバーしている区域，縮尺

(4) プロジェクト関連地域の地質資料，土質資料

2. 質問事項

(1) 上水道施設の現況

(2) Islam.および R. pindi 両市の人口動態と 2,000 年及び 2,030 年における人口推計の根拠

(3) 1 人あたり水使用量の実績

(4) Khanpur ダムの概要及び開発水量算出の根拠

(5) Canal 案及びトンネル案それぞれについての現在までの study の概要

(6) パ国政府の機構と CDA，WAPDA 等の位置づけ

QUESTIONNAIRE
ON
THE PRELIMINARY STUDY
FOR
CONDUCTION OF WATER
FROM KHANPUR TO ISLAMABAD/RAWALPINDI

A. AVAILABILITY OF DATA AND INFORMATIONS:

1) Amount of precipitation in the vicinity of the Khanpur Dam, with locations of observation points and observation period.
2) Discharge of the Hero River at the Khanpur Dam or in its vicinity.
3) Topographic map of the project area (covering area and scale).
4) Geological data or/and soil analysis of the project area.

B. QUESTIONS:

1) Present water supply system (facilities).
2) Vital statistics of both Islamabad and Rawalpindi, and basis of the population estimation of the years of 2000 and 2030.
3) Volume of water used by person per day.
4) General outline of the Khanpur Dam and the estimation basis of the created water volume.
5) Outline of studies so far submitted on each "canal" and "tunnel" conveyance system.
6) Organization of the Government, and functions and roles of CDA and WAPDA in connection to water management.
7) Changes in electric charges.
8) Plan for water supply scheme for industrial use.

REPLIES TO THE QUESTIONNAIRE

1. The Water Supply System of Islamabad has been planned on the basis of two water Sources viz Simly Dam and Khanpur Dam located about 20 to 25 miles away from Islamabad with production capacity/availability of 24 and 33 M.G.D. of water respectively. The total produce shall meet the requirement of Islamabad till 1995 at the present pace of city development.

The Simly Dam has been commissioned in 1982 and 12 M.G.D. of water is being received from the dam through one conduction line. The other conduction line is expected to be ready by Feb,1984. When full yield of 24 M.G.D. of Simly Dam shall be available for use. The Conduction of water from Khanpur Dam has not yet materialised.

In the meantime other sources, such as Surface Water, Spring Water and ground water have been tapped which produce about 31 M.G.D of water and meet the present requirement in full.

There are 8 Water Works, one major pumping station for pumping ground water and invididual tubewells scattered in and around Islamabad. The master plan showing the various sources of water and the respective areas of distribution has been handed over to the Japanese Survey team through Project Director Simly Dam.

The distribution system has been planned on the basis of artiries along the perepheries of individual sectors and further distribution to the Sectors has been made from the arterial/ peripherial mains. About 650 miles of main/subsidiary lines ranging from 36" dia to 3" dia pipes have been laid so far and are under effective operation.

3. The Volume of water used per head per day is as under:

i. Model Villages	30	gallons per head per day.
ii. Flates	50	-do-
iii. Houses &other than flats (having lawns).	100	-do-

8. There is no separate plan for water supply scheme for industrial use. There are small industries in Islamabad for which potable water is being supplied.

9/8/12/83.

(A.Q.NOMANI)
DIRECTOR WATER AND SEWERAGE

SECTION – I GENERAL DESCRIPTION OF ISLAMABAD

1.1 Introduction

Islamabad, literally meaning "the abode of Islam", is the capital of Islamic Republic of Pakistan. True to the meaning of its name, it embodies the Islamic values and the aspirations of the Muslims of South Asia which culminated in the establishment of Pakistan in 1947. Its freshness and beauty symbolise the hopes and aspirations of the people of Pakistan to revive in a modern context the glory and grandeur of the Muslim rule in South Asia.

2. It is also the expression of the national will to examplify the best in town planning and civic amenities with up-to-date technology. The rapidly emerging city has achieved a distinguished pattern and shape of its own.

3. President Muhammad Ayub Khan will always be remembered for giving lead to the nation in shifting the capital to Islamabad. Earlier, the capital of the country was Karachi, which was selected because of the exigencies prevailing at the time of the Independence. The need for a proper capital remained in the mind of the Government and its people all the time. In 1958, this important national task was taken up in right earnest and a high-powered Commission was established to assess the suitability of Karachi as capital and to recommend another site in case of its unsuitability. On the recommendation of this Commission, the Government decided in favour of the Potwar area and made a public announcement to this effect in June 1959. On February 24, 1960, the Government named the new capital as Islamabad.

4. To undertake the huge task of constructing a new capital within a reasonable time, an autonomous body with necessary legal status and backing was considered necessary. Consequently, the Capital Development Authority Ordinance was issued on June 14, 1960, constituting the Authority and defining its powers and duties. According to this Ordinance, the general direction and administration of the Authority and its affairs vest in a board consisting of not less than 3 members (Chairman, Financial Adviser and a Member) to be appointed by the Federal Government.

5. It was in October 1961 that the construction work commenced and exactly two years later, in October 1963, the new city came to life with the arrival of its first residents. Earlier, a greater part of the Secretariat of the Government of Pakistan was moved to Rawalpindi in October 1959 to be later shifted to Islamabad as and when the required Government buildings and residences for the Government employees were ready for occupation.

6. Till December 1980, the administrative and judicial control of Islamabad was exercised by the District Administration of Rawalpindi. This arrangement was not considered satisfactory in view of the various administrative requirements of the Federal Capital, fast growth of the area's population and inconvenience of the people living in Islamabad. Accordingly, a Presidential Order No 18 of 1980 was issued according to which the Federal Capital was given the status of an independent district, and an Administrator was appointed and made responsible for all administrative as well as judicial functions of Islamabad. His office started functioning on January 6, 1981. The Administrator is supported by a Deputy Commissioner, an Inspector-General of Police and related staff for running day-to-day administrative affairs.

7. The capital is spread over an area of 906 sq. km. It comprises (a) Islamabad proper, including institutional and industrial areas, covering 220 sq. km; (b) Islamabad Park occupying 220 sq. km. and (c) Islamabad rural area measuring 466 sq. km. Islamabad proper is planned in parallel belts as detailed below :--

(a) *Administrative Sector.*—This sector is located at the eastern end and is divided into three parts. The northern part consists of the Central Secretariat; the central part is earmarked for Presidency, Parliament and Supreme Court buildings; and the southern part is reserved for a cultural complex.

(b) *Diplomatic Enclave.*—A special enclave is planned to the south of the Administrative Sector for the offices and residences of foreign missions.

(c) *Public Buildings Area.*—This area is located to the west of the Administrative Sector and is meant for the head offices of autonomous and semi-autonomous organizations. Its northern portion is reserved for the houses of the federating units, while its southern portion is reserved for residential accommodation. The Government Hostel and the State Bank of Pakistan are located here.

(d) *Residential Sectors.*—The residential sectors have been planned in rows on both sides of the main civic and commercial centres called the Blue Area. Each sector is 3.1 sq. km. in area and is a self-contained community unit catering for all socio-economic needs.

(e) *Blue Area.*—It has been designed in a linear form, allowing its growth parallel to the residential sectors. It will have multi-storey commercial and office buildings along its main avenue -- the Khyaban-e-Quaid-i-Azam.

(f) *Industrial Zones.*—There are separate zones for location of manufacturing and light service industries. The manufacturing industry zone is loacted in close proximity to Rawalpindi. The light service industries and handicraft units have been located in a belt on the two lanes, skirting the southern edge

of the service road of the Residential Sectors. Both zones are currently humming with construction activities and a large number of commercial and industrial units have gone into production.

Islamabad Park

8. The Islamabad Park extends over an area of approximately 220 sq. km. and is earmarked for semi-urban functions. Institutions of national importance, such as the Atomic Research Institute and the National Health Laboratories, are functioning in this area. Institutions requiring large areas will be located in this Park. It will also have spacious sports centres, clubs, parks and exhibition grounds. A large sports complex is nearing completion. Agricultural, dairy and poultry farms are located in this area. Its functional scope has been enlarged to include establishment of a few model villages.

9. The Shakarparian hill, about 610 metres high, is located in this area which serves as a ventage point as it gives a panoramic view of the city. The Rawal Lake, and Rose & Jasmine Garden are also located here.

Islamabad Rural Area

10. This area, lying immediately to the north, east and south of the Islamabad Park and Islamabad proper, is spread over approximately 466 sq. km. This is an environmental area where strict planning control is exercised. The land use in this area is entirely agricultural so that the rural character of the area is strictly preserved. The area to the north of the Margala Hills is declared a wild-life sanctuary. Daman-e-Koh, a picnic spot, located in this area, commands a view of the entire city.

1.2 Location

Islamabad Federal Capital lies between 33^{o} – 29′ and 33^{o} – 48′ north latitudes and 72^{o} – 49′ and 73^{o} – 23′ east longitudes. It is bounded by Abbottabad district of the NWFP to the north and by Rawalpindi district of the Punjab on all other sides.

1.3 Topography

Islamabad is located on the northern-most edge of the tract known as Potwar Plateau. The site is an uneven table-land gradually rising in elevation from 500 metres to 600 metres above the sea level. In the extreme north, the hills rise more steeply. The highest point is 1600 metres above the sea level. Most of the Margalla Range in the north-west is composed of hill series belonging to the Eocene division of the Tertiary period and are about 60 million years old. The rock formations consist of grey or dark-coloured limestone with layers of shale containing fossils. The land gradually slopes towards the south. The lands are composed either of alluvium (clay or silt) or of gravel caps. The plains are formed of alluvial deposits laid by the past and the present river systems in varying thicknesses. A

large part of the area is undulating and at places it is badly dissected by gullies and ravines. The Kurang stream has been dammed at a place named Rawal to form the Rawal Lake. Another dam has been built on the Soan river to form the Simly Lake.

1.4 Climate

Islamabad has distinct seasons marked by wide variations in temperature. The coldest month is January when the mean maximum temperature is 16° C and the mean minimum temperature is 3°C. June is the hottest month with the mean maximum temperature of 40°C and the mean minimum temperature of 24°C. Throughout the year, the winds below predominantly from the west or the south-west, but in summer there are short spells of winds from the north or the south-east. Morning breezes are mostly from the west or the north-east in winter but from north-east alone in summer. In the afternoon, the dominant wind throughout the year is from the south-west.

The area has two distinct rainfall seasons, the summer season from July to September and the winter season from December to April. The bulk of monsoon precipitation occurs in July and August, with monthly averages of 200 and 225 millimetres respectively. The peaks of the Margalla Hills are sometimes covered with snow during winter. Thunder storms are more pronounced during July and August. Hail storms also occur in this area.

The mean monthly maximum and minimum temperatures and the mean monthly precipitation are given below along with corresponding means for the year as a whole :–

Month	Mean Temperature (°C)		Mean Precipitation (millimetres)
	Maximum	Minimum	
January	16.3	2.7	79
February	20.1	4.8	48
March	23.6	10.3	74
April	29.7	14.6	33
May	35.5	20.2	28
June	39.7	24.4	32
July	35.5	24.9	202
August	33.2	23.8	237
September	33.5	21.8	132
October	29.8	14.4	39
November	24.2	7.2	23
December	19.1	3.4	41
Annual	28.3	14.4	968

Source : Meteorological Department, Government of Pakistan, Islamabad.

1.5 Agriculture

The sources of irrigation in the area are surface streams, springs, wells and tubewells. However, the main source of water for agriculture is rainfall. Two channels from the Rawal Lake, one on the left and the other on the right side of the Rawal Dam, are used for irrigation purposes.

The area under cultivation, and agricultural produce statistics of various crops grown during 1980-81, are given in the following table :—

Crop	Area (hectares)	Production (tonnes)
Wheat	21,000	24,300
Maize	7,500	5,000
Mung	3,076	1,276
Mash	2,064	1,000
Ground-nut	373	420

Source : Agricultural Statistics of Pakistan, 1981. Food and Agricultural Division Islamabad.

1.6 Industry

The industrial areas of Islamabad can broadly be divided into three groups :

(a) Industrial Area of Sector I

In this sector half the area has been reserved for industrial units and half for residential purposes. Various kinds of industries such as flour mills, steel re-rolling, marble finishing, etc., have been established in Sector I-9. There are 148 industrial units in Islamabad, mostly located in Sector I-9 except the Pakistan Railway Carriage Factory which is located in Sector I-11.

(b) Light Industrial and Workshop Area in Sector G

In this area, light industrial units have been established. Some development of industries in Sectors G-6, G-7, G-8 and G-9 had already taken place. The Printing Corporation of Pakistan Press, Islamabad is located in Sector G-7. Further development is taking place in Sectors G-9 and G-10.

(c) Subsidiary Industrial Triangle

A subsidiary industrial zone with its boundary formed by Soan river, Shahrah-e-Islamabad, and the Capital Territory boundary near Rawat, has been allocated for river-oriented industries as well as those industries which cause air pollution and are detrimental to human health.

1.7 Communication

The road net work in the urban area of Islamabad is designed to provide an effective transportation system to serve all sectors of the city. It consists of various specifications, such as highways, main roads, and service roads. The total length of metalled and unmetalled roads are 597 kilometres and 60 kilometres respectively. Recently, the Capital Development Authority has started a project to link all the rural areas in the capital with metalled roads. Islamabd has also been linked by railway line at Margalla, situated between Sectors I-9 and H-9. This rail connection, though not utilized for passengers transportation, has, however, provided transportation facilities for industries in Sector I-9.

Islamabad is an international airport with good domestic and international connections. It is directly linked to Middle-East, Europe and China.

There were 11,487 telephone connections, 11 telegraph offices and 60 post offices. Islamabad is linked to the NWD/STD systems and gate-way exchange system for rapid and quick internal as well as external communications.

1.8 Education

Islamanad has three universities, viz., Quaid-i-Azam University, Allama Iqbal Open University, and Islamic University. A brief description of each University follows :—

(a) Quaid-i-Azam University

The Quaid-i-Azam University, spread over approximately 607 hectares, is located in the north-east corner of Islamabad. It was established on October 5, 1971 as an advanced institution with a view to producing experts and specialists in various fields to meet the demand of academic institutions and research organizations in the country. It is a residential and postgraduate institution of teaching and research in both natural and social sciences. There are 14 academic departments in the University. Two new departments; viz. Area Studies and Strategic Studies, have been recently created.

(b) Allama Iqbal Open University

The idea of the Open University was floated in the late 1960s, and came to fruition with the enunciation of broad principles of education policies during the 1972-80. Open universities are being used in several countries to provide education and training to the people who cannot leave their homes and jobs for full-time studies. This university is, therefore, established to provide education facilities through correspondence courses, tutorials, seminars, workshops, laboratories, television and radio broadcasts. The University commenced working as a recognised entity in June 1974.

(c) The Islamic University

To provide a sound educational and research base for proper introduction of Islamic system in different walks of life, it was decided to establish a university of Islamic learning.

The University was therefore established in November 1980 in the premises of the Shah Faisal Mosque which is being built as the biggest mosque in the world. The Islamic University offers educational programmes in three areas :—

(i) Shari'ah wa Qanun,
(ii) Da'wah Usul al Din and Qir'at, and
(iii) Social Sciences (at present Economics only)

The University also imparts professional training in Shari'ah to the existing cadres in judiciary, civil service and law enforcement. It conducts research, especially in Islamic enconomics.

The number of students enrolled in various educational institutions of Islamabad during the academic year 1981-82 are given below :—

Institutions	Number	Enrolment
University	3	1240 (excluding Allama Iqbal Open University)
College of Commerce	1	289
College (Others)	3	4,032
High School	35	4,970
Middle School	27	10,578
Primary School	140	36,865
Islamabad Model College	2	3,439
Islamabad Model School	2	2,050

Source :—Concerned Institutes.

1.9 Health

There are two hospitals and 18 dispensaries in Islamabad. Seven dispensaries are working under the Capital Development Authority, and 11 dispensaries under the Federal Government of Pakistan. In order to meet the growing needs of the Islamabad district, the Federal Government is constructing a major hospital complex which is nearing completion.

SECTION — 2 MAIN FINDINGS OF 1980 HOUSING CENSUS

2.1 Housing Unit, Room and Person

There were 59,019 housing units in Islamabad, out of which 37.4 and 62.6 percents were in rural and urban areas respectively. About 60 percent Housing units had 1 to 2 rooms. The number of persons per housing unit in Islamabad and its rural and urban areas worked out to be 5.7, 5.8 and 5.6 respectively. The average number of persons per room in Islamabad and its rural and urban areas were 2.2, 2.3 and 2.1 respectively.

2.2 Tenure

Fifty-seven percent housing units were occupied by their owners. The rented and rent free housing units were 34 percent and 9 percent respectively. In rural areas the percentage of owner – occupied housing units was quite high i.e. 88 percent as against 38 percent in urban area. The percentage of rented houses was higher in urban area i.e. 50 percent as against only 6 percent in rural housing units. The percentage of rent-free housing units was almost double in urban area i.e. 11 percent as compared to 6 percent in rural housing units.

2.3 Period of Construction

More than 40 percent of the housing units were constructed during the last decade. The construction during this period had been greater in urban area i.e. 43 percent as compared to 38 percent in rural areas. The pace of construction during the 1947-70 period had also been faster in urban area i.e. 45 percent as against 35 percent in rural areas. Less than one-fifth of the houses were constructed before 1947.

2.4 Construction Material of outer Walls and Roofs

Baked bricks/blocks/stone and cement were the main construction materials, for outer walls, used by 55 percent of the housing units. In importance, this material was followed by baked bricks/stone and mud, used by 32 percent of the housing units. The use of unbaked bricks and mud had been only 12 percent. In urban area a higher use of baked bricks/blocks/stone and cement had been made i.e. 68 percent as compared to 35 percent in rural areas. On the other hand, baked bricks/stone and mud had been used by more housing units (35 percent) in the rural areas than those in the urban area (18 percent).

The use of RCC/RBC for construction of roof in the urban area was quite high: as against 18 percent, 65 percent in rural areas. Eighty-one percent of the housing units in the rural areas used girder/beam, wood, baked bricks, etc.

2.5 Source of Drinking Water

Forty-seven percent of the housing units had piped water for drinking. The next important source of drinking water was well either inside or outside the housing units and was used by 45 percent of the housing units. In rural areas, 77 percent of the housing units obtained drinking water from well. In rural areas, piped water was used by only 7 percent of the housing units. The figure for the use of water from spring, river, stream, etc. is 15 percent for the rural areas. In urban area, 71 percent of the housing units obtained piped drinking water, while wells outside the housing units provided water to about 25 percent of the housing units.

2.6 Source of Lighting

Electricity was the main source of lighting which was used by 62 percent of the housing units. Thirty-seven percent of the housing units used kerosene oil for lighting. In

rural areas, kerosene oil and electricity were the two major sources for this purpose and were used by 54 percent and 45 percent of the housing units respectively. The main source of lighting in urban area was electricity which was used by 71 percent of the housing units. Kerosene oil was used by 28 percent of the housing units.

2.7 Cooking fuel used

Fifty-one percent of the housing units used wood as cooking fuel. Piped/cylinder gas was used as cooking fuel by about 38 percent of the housing units. Kerosene oil was used by only 6 percent of the housing units. In rural areas, wood was used by 84 percent of the housing units. The percentage use of kerosene oil was 8 for rural areas and 5 for urban area. Piped/cylinder gas was used by 59 percent of the housing units in urban area. Thirty-six percent of the housing units used wood and kerosene oil as alternative cooking fuel in urban area.

2.8 Availability of Kitchen, Bathroom and Latrine Facility—Urban Area only

This question was asked to urban households only. Seventy percent of the housing units had separate kitchen facility. A little more than one-fourth of the housing units had no kitchen facility. Separate bathroom facility was available to 63 percent of the housing units. Bathroom facility was not available to one-third of the housing units. The facility of separate latrine with flush was available to 60 percent of the housing units. Thirty-six percent of the housing units had no latrine facility at all.

SECTION – 3 MAIN FINDINGS OF 1981 POPULATION CENSUS

3.1 Population Size, Growth and Distribution

The total population of Islamabad as of 1st March, 1981 was 340,286 as compared to 234,813 on September 16, 1972. The percentage increase during this period of 8.46 years had been 45.0 with an annual growth rate of 4.5 percent. The total population of Islamabad and percent increases in the intercensal period since 1951 are given in the following table :—

Year	Population			Percentage increase		
	Total	Urban	Rural	Total	Urban	Rural
1951	83,170	–	83,170	–	–	–
1961	119,307	–	119,307	43.4	–	43.4
1972	234,813	76,641	158,172	96.8	–	32.6
1981	340,286	204,364	135,922	45.0	166.6	(–)14.1

The percentage increase during 1951-61 and 1972-81 had been about the same. However, an increase of 96.8 percent during 1961-72, which was due to the shifting of the capital, was much higher because of the movement of population into Islamabad in this period.

The area now comprising Islamabad was all rural before its declaration as federal capital. Its urban area in 1972 was 65 sq. km. which was extended to 311 sq. km. at the time of the 1981 Population Census. Urbanization in Islamabad thus rose from 32 in 1972 to 60 percent in 1981.

The urban population increased by 166.6 percent and the rural population decreased by 14.1 percent in the 1972-81 period. This was partly due to re-classification of areas. The rapid growth in urban area is likely to continue because of future development of more residential sectors. The population density was 376 persons per sq. km.

3.2 Sex Composition

The sex ratio (males per hundred females) in 1981 was 119 which was more than the sex-ratio of 111 for the country. it was higher in urban Islamabad (125) than (111) in rural Islamabad.

3.3 Age Structure

Forty percent of the total population of Islamabad was below 15 years, and 5.6 percent was 60 years and above. Thus the dependency ratio (percentage ratio of population below 15 years and 65 and above, to population between 15-64 years) was 78.0 percent. The proportion of under 15 population in rural areas was 42 percent as compared to 39 percent in the urban area. The proportion of population above 60 years was also higher (6.7 percent) in rural areas than in the urban area (4.8 percent). The dependency ratios in rural and urban areas were 86.5 percent and 72.4 percent respectively. The percentage of voting population (i.e. 21 years and above, constitute 46.7 percent of the total population. The corresponding percentages in rural and urban areas were 45.0 and 48.0 respectively.

3.4 Marital Status

Twenty-eight percent of the total population of 15 years and above were 'never-married', 67 percent married and 0.2 percent divorced. These percentages vary for males and females. Thirty-three percent males were never married, 65 percent married and 0.15 percent divorced. The percentage of never-married females was 22, which was lower than that of males. The percentage of married female was 69 and of divorced female 0.4.

3.5 Religion

Ninety-seven percent of the population of Islamabad consists of Muslims. The second largest religious group was that of Christians who were about 2.3 percent.

3.6 Literacy

Literacy in Islamabad, in 1981, was 47.8 percent as compared to 40.1 percent in 1972. The male literacy increased from 53.2 percent in 1972 to 59.1 percent in 1981,

whereas female literacy, showing greater increase, increased from 22.7 percent in 1972 to 33.5 percent in 1981.

3.7 School Attendance

Half of the population of Islamabad was exposed to some form of education; 21 percent of the population of '5 years and above' were currently enrolled, and 29 percent of that population had completed their education. The remaining fifty percent never attended any formal education.

The percentage of students in urban Islamabad was 26.2 as compared to 13.2 percent in rural Islamabad. The percentage of those who never attended any educational institution was higher (66.4) in rural Islamabad than (39) in urban Islamabad.

There were 61,383 students in Islamabad. Thirty-seven percent were attending classes below primary level, 19 percent were enrolled in classes 6-8, and 12.3 percent were in 9th and 10th classes. The percentage of students attending intermediate classes was 4.6. Of those studying for baccalaurate it was 1.4 and of those attending post-graduate degree classes it was 0.2.

The age-specific percentages of students in age groups 5-9, 10-14, 15-19 and 20 & above were 38.0, 55.6, 38.3 and 4.5 percents respectively.

The highest school-attendance percentage (55.6) was observed in age group 10-14. This percentage for urban Islamabad was 66.7 and for rural Islamabad 40.1.

3.8 Educational Attainment

This question pertains to the population of '10 years and above'. Thirty-five percent had completed primary education, 42 percent middle and matriculation education and 9.2 percent intermediate education in arts and science. The number of graduates in Islamabad were estimated at 8,956. Those having completed Master's programmes in Arts and Sciences numbered 3,868. There were 860 engineering graduates, 534 medical graduates and 500 law graduates.

3.9 Labour Force

Twenty-seven percent of the population of Islamabad was in labour force (i.e. all those working and looking for work). Males contributed 48 percent of the labour force while females accounted for only 3 percent.

If the labour participation rates were worked out with respect to the population of '10 years and above' to whom the question on activity was asked, then these rates for both sexes, males and females were 38.2, 65.1 and 4.3 percents respectively.

The labour force participation rates for urban Islamabad in respect of both sexes, males and females were 28.2, 47.3 and 4.4 percents respectively, as compared to 26.1, 48.7 and 1.0 percents respectively in rural Islamabad.

3.10 Employment

Unemployment rate is the percentage of persons looking for work to the total number of persons working and looking for work. The unemployment rate for Islamabad was 10.7 percent. It was higher for females (21.0 percent) than for males (10.2 percent).

3.11 Occupation

In urban Islamabad, around 21.2 percent of the labour force consisted of production workers, transport equipment operators and labourers. Another 20.1 percent were clerks and related workers. Eleven percent were professional, technical and related and service workers. In rural Islamabad the main concentration was in (a) agriculture related occupations and (b) production work, transport equipment operator and labour where two-thirds of the labour force was engaged.

3.12 Employment Status

In urban Islamabad, 56 percent of the working population were government employees and 23 percent non-government employees. In rural Islamabad they were 24 and 21 percents respectively.

3.13 Industry

Out of the total working population '10 years and above' (83,101), 18 percent were engaged in agriculture and related activity, and another 6 percent were in construction industry. Most (39.3 percent) of the working population were engaged in community, social and personal services activities including government, semi-government and autonomous departments.

In rural Islamabad 39 percent of the population was mainly engaged in agriculture and related fields, whereas in urban Islamabad 50 percent of the population was mainly engaged in community, social and personal services.

3.14 Migration

The migrant population refered to those who were now residing in Islambad but were living earlier in some other district, province or country. One-third of the population of Islamabad was migrant, of which 91 percent lived in the urban area. Forty-three percent of the migrants in urban Islamabad had migrated during the last 5 years, 30 percent during the last 5 to 9 years and 27 percent 10 or more years earlier. These time periods were with reference to the census date viz. 1st March, 1981. Sixty-five percent of these migrants were literate, out of which 81 percent had not yet obtained bachelor degrees. Most of the female migrants were illiterate whereas male migrants were mostly literate.

TABLE 1 – HOUSING UNITS BY NUMBER OF ROOMS AND HOUSEHOLD SIZE

Housing Unit/Household Size	Housing Units by Number of Rooms					Housing Units		Rooms Per H. Unit
	1 Room	2 Rooms	3 Rooms	4 Rooms	5 & More	Total	Percent	
ISLAMABAD								
1 PERSON	2,045	1,198	265	152	132	3,792	6.43	1.8
2 PERSONS	1,918	1,801	628	257	316	4,920	8.34	2.1
3 PERSONS	1,953	2,239	844	370	417	5,723	9.70	2.2
4 PERSONS	1,697	2,794	1,289	632	662	7,274	12.32	2.4
5 PERSONS	1,622	2,968	1,593	908	946	7,937	13.45	2.7
6 PERSONS	1,551	3,071	1,761	875	992	8,250	13.98	2.7
7 PERSONS	1,080	2,404	1,452	781	870	6,587	11.16	2.8
8 PERSONS	836	1,987	1,269	716	777	5,585	9.46	2.9
9 PERSONS	453	1,104	868	447	516	3,388	5.74	3.0
10 PERSONS	283	765	596	370	439	2,453	4.16	3.2
11 14 PERSONS	276	694	608	400	626	2,604	4.41	3.5
15 PERSONS & MORE	58	93	83	81	191	506	0.86	5.4
TOTAL	13,872	21,118	11,256	5,889	6,884	59,019	100.00	2.6
PERCENT	23.50	35.78	19.07	9.98	11.66	100.00		
PERSONS PER H. UNIT	4.5	5.5	6.3	6.6	7.0	5.7		
PERSONS PER ROOM	4.5	2.8	2.1	1.6	1.2	2.2		
ISLAMABAD – RURAL								
1 PERSON	550	285	74	37	19	965	4.38	1.7
2 PERSONS	763	677	228	93	51	1,812	8.22	1.9
3 PERSONS	793	834	326	134	71	2,158	9.79	2.0
4 PERSONS	810	1,020	497	217	115	2,659	12.06	2.2
5 PERSONS	714	1,161	635	297	205	3,012	13.66	2.4
6 PERSONS	697	1,171	732	354	249	3,203	14.53	2.5
7 PERSONS	522	912	634	344	243	2,655	12.04	2.6
8 PERSONS	332	705	530	321	269	2,157	9.78	2.9
9 PERSONS	177	411	388	196	190	1,362	6.18	3.0
10 PERSONS	85	239	227	179	180	910	4.13	3.3
11 14 PERSONS	93	221	235	175	248	972	4.41	3.7
15 PERSONS & MORE	16	30	29	28	78	181	0.82	4.6
TOTAL	5,552	7,666	4,535	2,375	1,918	22,046	100.00	2.5
PERCENT	25.18	34.77	20.57	10.77	8.70	100.00		
PERSONS PER H. UNIT	4.6	5.5	6.3	6.8	8.0	5.8		
PERSONS PER ROOM	4.6	2.8	2.1	1.7	1.4	2.3		

Housing Unit/Household Size	Housing Units by Number of Rooms					Housing Units		Rooms Per H. Unit
	1 Room	2 Rooms	3 Rooms	4 Rooms	5 & More	Total	Percent	
ISLAMABAD -- URBAN								
1 PERSON	1,495	913	191	115	113	2,827	7.65	1.8
2 PERSONS	1,155	1,124	400	164	265	3,108	8.41	2.2
3 PERSONS	1,060	1,405	518	236	346	3,565	9.64	2.4
4 PERSONS	1,087	1,774	792	415	547	4,615	12.48	2.6
5 PERSONS	908	1,807	958	511	741	4,925	13.32	2.8
6 PERSONS	854	1,900	1,029	521	743	5,047	13.65	2.8
7 PERSONS	558	1,492	818	437	627	3,932	10.63	2.9
8 PERSONS	504	1,282	739	395	508	3,428	9.27	2.9
9 PERSONS	276	693	480	251	326	2,026	5.48	3.0
10 PERSONS	198	526	369	191	259	1,543	4.17	3.1
11 14 PERSONS	193	473	373	225	378	1,632	4.41	3.4
15 PERSONS & MORE	42	63	54	53	113	325	0.88	5.8
TOTAL	8,320	13,452	6,721	3,514	4,966	36,973	100.00	2.7
PERCENT	22.50	36.38	18.18	9.50	13.43	100.00		
PERSONS PER H. UNIT	4.4	5.5	6.2	6.4	6.5	5.6		
PERSONS PER ROOM	4.4	2.7	2.1	1.6	1.1	2.1		

TABLE 5 – HOUSING UNITS BY SOURCE OF DRINKING WATER, LIGHTING AND COOKING FUEL USED – ISLAMBAD

Housing Facility	Total	Percent	Rural	Percent	Urban	Percent
SOURCE OF DRINKING WATER– INSIDE HOUSING UNIT						
Piped	24,376	41	1,121	5	23,255	63
Hand-pump	97	–	74	–	23	–
Well	1,102	3	638	4	464	2
SOURCE OF DRINKING WATER– OUTSIDE HOUSING UNIT						
Piped	3,482	6	468	2	3,014	8
Hand-pump	97	–	23	–	74	–
Well	25,379	43	16,333	74	9,046	24
Pond	86	–	54	–	32	–
Spring/River/Stream, etc.	4,400	7	3,335	15	1,065	3
SOURCE OF LIGHT						
Electricity	36,408	62	10,102	46	26,306	71
Kerosene	22,119	37	11,922	54	10,197	28
Others	492	1	22	–	470	1
COOKING FUEL USED						
Wood	29,859	51	18,532	84	11,327	31
Coal/Charcoal	94	–	47	–	47	–
Kerosene	3,629	6	1,798	8	1,831	5
Gas	22,399	38	474	2	21,925	59
Electricity	23	–	9	–	14	–
Dung-Cake, etc.	3,015	5	1,186	5	1,829	5
Total	59,019	100	22,046	100	36,973	100

TABLE 6 – HOUSING UNITS BY KITCHEN, BATHROOM AND LATRINE FACILITIES – ISLAMABAD

Housing units	Housing Facilities										
	Kitchen			Bath room			Latrine				
							Separate		Shared		None
	Separate	Shared	None	Separate	Shared	None	With flush	Without flush	With flush	Without flush	
Number	25,786	968	10,219	23,364	1,189	12,420	22,291	218	1,043	74	13,347
Percent	69.74	2.62	27.64	63.19	3.22	33.59	60.29	0.59	2.82	0.20	36.10

VITAL STATISTICS OF ISLAMABAD.

1.	Total area	= 351 Sq.miles.
2.	Total Residential Sectors.	= 44 nos.
3.	Res. Sectors Developed upto 1983.	= 10 nos.
4.	Population(1981 Census)	= 3,40,286.
	i) Urban	= 2,04,364
	ii) Rural	= 1,35,922
5.	Total Housing Units.	
	Planned upto 1983.	= 25166
	i) Private Sectors	= 11,166
	ii) Public Sectors	= 14,080
6.	Industrial Plots Planned	= 990
	i) Functioning Units.	= 148
7.	Planned Agro-farming Scheme.	= 5
	i) Total acruge	= 5347
	ii) Total Units.	= 341
8.	Planned Model villages.	= 12
	i) Total Acruge	= 782.98
	ii) Total Units.	= 8519
9.	Planned Industrial and Trading Centre (I & T) Plots.	= 373
10.	Planned Motels	=9
11.	Planned Hotels	= 10
12.	Special Institutions Plots (sectors H-9 and H-10)	= 65
13.	Orchard Plots (Sectors H-9 and H-10)	= 56
14.	Planned Community Facility.	
	i) Primary Schools	= 113
	ii) Secondary Schools	= 56
	iii) Colleges	= 6
	iv) University	= 2
	v) Shopping Centres	= 104
	vi) Shops	3799
	vii) Health Centre	= 63
	viii) Mosques	= 68
	ix) Play grounds.	= 82

RAWALPINDI + ISLAMABAD- POPULATION GROWTH AND PROPORTION COMPARING BOTH CITIES.

1. 1) PIDE Projection (R) and Assumption a (1).

Year	Rawalpindi + Islamabad Population	%	Rawalpindi Population	%	Islamabad Population	%
1970	569,051	100	513,051	91.0	46,000	8.1
1980	852,816	100	755,216	91.6	97,600	8.4
1990	1,187,072	100	1,035,972	87.3	151,700	12.7
2000	1,575,464	100	1,357,124	+86.2	218,350	13.8
1985.	1,017.308	100	893,508	87.8	123,800	12.2

+ own extrapolation according to declining rates of PIDE Projection

2) A sumption (7) (R) with 50% variation in the decade based on socio-economic survey figure and extrapolation and Assumption (b) (1).

Year	Rawalpindi + Islamabad Population	%	Rawalpindi Population	%	Islamabad Population	%
1971	592,000	100	540,000	91.3	52,000	8.7
1981	918.900	100	8101000	88.3	1081900	11.8
1991	1,381,550	100	1,215,000	87.3	176,550	12.7
2001	2,080,400	100	1,822,000	87.6	134,230	12.4
1985.	1,074,230	100	940,000	87.5	134,230	12.5

Khanpur Dam project

* PROJECT AT A GLANCE *

1.	River.	Haro
2.	Location.	District Hazara Tehsil Haripur near Khanpur Town.
3.	Catchment Area.	308 square miles.
4.	Type of Dam.	Earthen Dam.
5.	Height of Dam.	167 feet.
6.	Gross Reservoir Capacity.	1,06,000 acre feet.
7.	Dead Storage.	15,500 acre feet.
8.	Live Storage.	91,500 acre feet.
9.	Life of Project.	75 years.
10.	Mean Annual Run-off.	2,80,000 acre feet.
11.	Maximum Flood anticipated.	1,82,000 cusecs.
12.	Spillway Capacity.	1,70,000 cusecs.
13.	Spillway Gates.	5 Radial Gates 40' x 35'
14.	Spillway Crest Length.	232 feet.
15.	Capacity of Irrigation Sluice.	650 cusecs.
16.	Gross commanded area.	1,24,000 acres.
17.	Culturable commanded area.	36,470) Right Bank Canal 22785) Left Bank Canal 13685 Total: 36470 acres.
18.	Crop acre per annum.	47411
19.	Crop intensity	130%
20.	Municipal & Industrial Water Supplies.	131 million gallons per day.
21.	Total cost of the Project.	Rs. 57000 thousand.

22.	Foreign Exchange. Component.	Rs. 30600 thousands.
23.	Water rate per crop acre.	Rs. 30.00
24.	Water charges per 1000 gallons.	Rs. 1.15 (for domestic/ industrial use).
25.	Completion Date.	1977
26.	Cost Benefit Ratio.	1 : 2.68
27.	Annual recurring cost (Maintenance & Operation).	Rs. 1815000
28.	Annual Income from Project.	Rs. 5,60,81,350

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RAWAL DAM PROJECT.
SALIENT FEATURES.

Location	One mile North East of Islamabad.
Height of Dam.	II3.5 Feet.
Leanght of Dam.	700 Feet.
Reservior capacity.	20 M.G.D to Rawalpindi Islamabad and for irrigation of I2000 area.
Completion.	I962.

SIMLY DAM PROJECT

Simly Dam Project is an essential constituent of bulk water supply scheme for the Federal Capital. It is situated 24 miles North East of Islamabad. It derives its name from a small village 'SIMLY' situated within the Reservoir. The reservoir created by the structure will have a gross storage capacity of 28,750 acre feet and a net live storage of 20,000 acre feet.

SALIENT FEATURES.

1. MAIN DAM

   Main Dam is 1010 feet long with maximum height of 263 ft. It has a sloping impervious clay core with up-stream and down-stream rock fill shells to provide stability.

2. SPILLWAY.

   An over flow type concrete spillway with a maximum capacity of 45,000 Cs. is provided.

3. OUTLET WORKS.

   A 6 ft. dia tunnel for release of water is provided on the left abutment. Its discharge capacity is 44.50 Cs.

4. RESERVOIRS.

   Reservoir is 7 miles long. It covers an area of 421 acres and will have useable capacity of water of 20,000 acre ft.

SIMLY DAM PROJECT ISLAMABAD

SALIENT FEATURES

LOCATION	North-east of Islamabad	24 Miles
CONSTRUCTION		3 years
LIFE		63 Years
PROJECT VOLUME	TOTAL FILLS	2485500 Cu.Yds.
	EXCAVATION	338000 "
	CONCRETE	52990 "
RESERVOIR	LENGTH	7 Miles
	MAX. DEPTH	263 Ft.
	AREA	421 Acres.
	USEABLE CAPACITY	20000 Acre Ft.
	DEAD STORAGE	8750 " "
EMBANKMENT DAM	LENGTH AT CREST	1010 Ft.
	MAX. HEIGHT	263 Ft.
	ROCK FILL	1808000 Cu.Yds.
	IMPERVIOUS FILL	640000 "
U/S COFFER DAM	LENGTH AT CREST	332 Ft.
	MAX.HEIGHT	90 Ft.
	RANDOM ROCK FILL	32500 Cu.Yds.
	IMPERVIOUS FILL	84900 "
D/S COFFER DAM	LENGTH AT CREST	211 Ft.
	MAX. HEIGHT	35 Ft.
	RANDOM ROCKFILL	16700 Cu.Yds.
SPILLWAY	OVERFLOW WEIR	110 Ft. at Crest
	DISCH. CAPACITY	45000 Cs.
	CONCRETE VOLUME	49600 Cu.Yds.
OUTLET WORKS	TUNNEL DIA	6 Ft.
	LENGTH	590 Ft.
	DISCH. CAPACITY	44.5 Cs.
	CONCRETE VOLUME	1750 Cu.yds.
DIVERSION TUNNEL. (CONSTRUCTION COMPLETED)	LENGTH	594 Ft.
	SHAPE	HORSE SHOE
	DIA	20 Ft.
	LINING	R.C.C.
	CONCRETE	7600 Cu.Yds.
R.C.C. CONDUIT (CONSTRUCTION COMPLETED)	LENGTH	344 Ft.
	SHAPE	HORSE SHOE
	DIA	28 Ft.
	CONCRETE	10272 Cu.Yds.
DRAINAGE GALLERY WITH DRAINAGE WELLS.	Size	5 x 7.5 ft.
	LENGTH	432 Ft.