REPUBLIC OF TURKEY

No. 02

THE GENERAL DIRECTORATE OF STATE HYDRAULIC WORKS

FEASIBILITY STUDY ON ADATEPE IRRIGATION PROJECT

FINAL REPORT

VOLUME 2 APPENDIX

FEBRUARY 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF TURKEY

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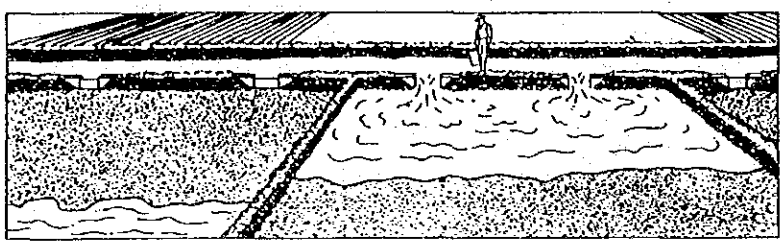


Appendix-I

General Information of the Republic of Turkey

APPENDIX-I GENERAL COUNTRY DATA FOR THE REPUBLIC OF TURKEY

I-1. General

Geography

Turkey consists of European Turkey around Istanbul at the southeastern corner of the European continent, and Asian Turkey on the opposite side of the Dardanelles. European Turkey is largely plain. Asian Turkey is mountainous, dominated by the Taurus mountains running east to west, with a narrow strip of plain along the Mediterranean and Aegean coasts.

Economic Conditions

There is a large regional disparity between the more developed Northwest area and the less developed southeast area. The current administration's economic policy includes ① attraction of foreign policy through an open domestic market, ② expansion of exports, ③ privatization of government run industry and ④ fiscal restraint to suppress inflation. High economic growth rates of 8.1% and 7.4% were recorded for 1986 and 1987, respectively. However, this dropped to 3.4% under fiscal restraint in 1988. Inflation rate was 55% and 75% in 1987 and 1988, respectively. Unemployment was a high 14% in 1988. In 1988, money sent home from workers overseas was US$ 1.8 billion; income from tourism totaled US$ 2.4 billion; and the trade deficit was US$ 1.8 billion. Foreign debt at the end of 1988 was US$ 37.7 billion.

Capital

Ankara

Type of Government

Republic

Climate

Continental climate; semi-arid climate

Mean temperature: 11.7°C

Annual precipitation: 372mm

Land use (1987)

Total area: 779,000 km^2

Agricultural land:	27.9 million ha (35.9%)
Forest:	20.2 million ha (25.7%)
Other:	29.8 million ha (38.2%)

Population (1985)

50.7 million

Population Density (1985)

65 persons/ km^2

Employed Population (1985)

Total employed population:	20.6 million
Primary:	12.1 million (58.9%)
Secondary:	3.1 million (15.1%)
Tertiary:	5.24 million (25.5%)

Gross Domestic Product (1988)

US$ 70 billion

Per Capita Income (1988)

US$ 1,293

National Budget (1989)

US$ 15.3 billion

Currency

Turkish Lira; US$ 1 = TL 2,140

Major Exports (1988)

Primary agricultural and fisheries products:	20.1%
Textiles:	19.7%
Steel:	12.5%
Processed agricultural products:	7.6%

Chemicals:	6.3%
Leather goods:	4.4%

Major Export Destinations (1988)

West Germany	20.1%
Iraq	8.5%
Italy	8.2%
US	6.5%
UK	4.9%
Iran	4.7%
France	4.3%

Major Imports (1988)

Oil:	17.0%
Chemicals:	13.8%
Steel:	11.5%
Electrical goods:	7.5%
Processed agricultural products:	5.1%
Automobiles:	4.8%

Major Importing Countries (1988)

West Germany	14.3%
US	10.6%
Iraq	10.0%
Italy	7.0%
France	5.8%
UK	5.2%
Iran	4.6%

Language

Turkish

People

Turkish, Kurdish, Arabic, Greek, Armenian, Jewish

Religion

Islamic, Christian, Hebrew

I-2. Agriculture

General

Cultivated area in Turkey is next to that of France and the Soviet Union in the European-Middle Eastern region. Cereals, fruits, vegetables, nuts, cotton, tobacco and poppies are widely farmed. Animal husbandry including cattle, horses and sheep is also widely practiced. The country is one of the few net exporters of food. Agriculture accounts for 16.9% of the GDP. Primary and processed agricultural products are 32.1% (1988) of exports.

A problem, however, is the large controlling effect weather has on production, with large fluctuations occurring from year to year. This is due to lack of irrigation facilities (irrigated area at the end of 1987: 3.77million ha). Irrigation projects are currently being pursued mainly in the semi-arid southeastern Anatolia area.

Agricultural Policy

Current government agricultural policy includes the following: extension of farm technology; land reform; strengthening of cooperatives; establishment of irrigation facilities to increase productivity; development of the southeast Anatolia region; price support system; financing and assistance for purchase of farm machinery and equipment; price stabilization policy; technical guidance and training for farm mechanization; introduction of seeds and seedlings for improved varieties; improved quality of vegetables and fruits; streamlining of the distribution system for farm products; extension of artificial insemination; pest control; reforestation; selective tree cutting; shift from wood to other fuels; promotion of fisheries; water quality control; streamlining of the distribution system for fisheries products; strengthening of fishery cooperatives; etc.

Agricultural Related Budget (1985)

US$ 1.1 billion

Percentage of Agricultural Related Budget within National Budget (1985)

7.3%

Farm Households (1987)

3.56 million

Population Employed on Farms (1985)

12.1 million

Cultivated Area (1987)

Total:	27.9 million ha
Field:	19.3 million ha
Orchard:	3 million ha
Pasture:	5.6 million ha

Cultivated Area per Farm Household (1980)

5.4 ha per household

Agricultural Product (1988)

US$ 1.1 billion

Major Agricultural Products (1988)

Wheat	20.5 million tons
Barley	7.5 million tons
Corn	2 million tons
Tomato	5.75 million tons
Sugar beet	11.5 million tons
Grape	3.35 million
Cotton	1.5 million tons
Apple	1.9 million tons

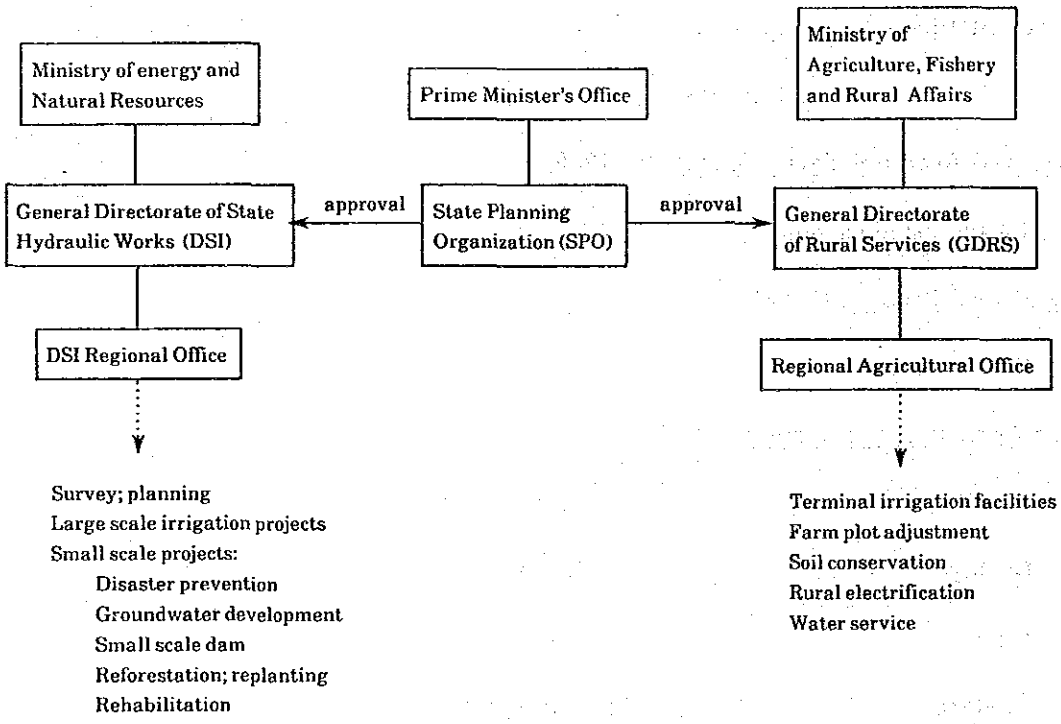
Potato	4.35 million tons
Watermelon, melon	5.25 million tons

I-3. Procedure and Implementation of Projects in Agricultural Sector

Pertinent Laws and Regulations

Regulations of the General Directorate of State Hydraulic Works; groundwater legislation; regulations of the regional development banks; regulations of the Ministry of Agriculture, Fishery and Rural Affairs, environmental legislation

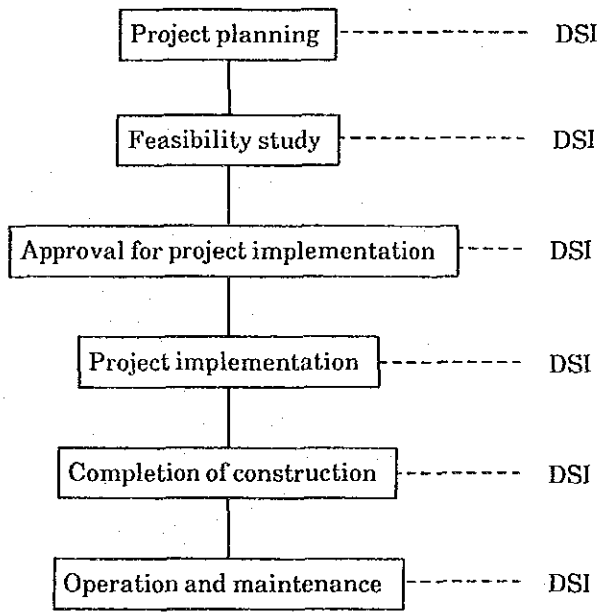
Project Implementing Structure



Types of Projects

Type of Project	Components	Implementing Agency
Large scale irrigation projects	Construction/rehabilitation of dam, diversion weir, canal, lift/drainage pump stations, etc., where benefit area is over 500~1000ha	DSI
Small scale projects	Small scale flood protection dams, reservoirs, groundwater development, environment improvement, rehabilitation, etc.	DSI
Terminal irrigation facilities	On-farm irrigation facilities	GDRS
Farm plot adjustment		GDRS
Farm road		GDRS
Soil conservation		GDRS
Rural electrification		GDRS
Water service		GDRS

Project Implementation Procedure



Project Cost

Construction cost is to be paid by the beneficiaries within 50 years; however, no interest is charged. In principle, operation and maintenance costs are totally borne by the beneficiaries.

Operation and Maintenance of Irrigation and Drainage Facilities

DSI undertakes O/M works.

Extent of Irrigation (1988)

Irrigable area:	25.3 million ha
Irrigated area:	3.8 million ha
Irrigation rate:	14.9%

Project Cost for Land Improvement (1989)

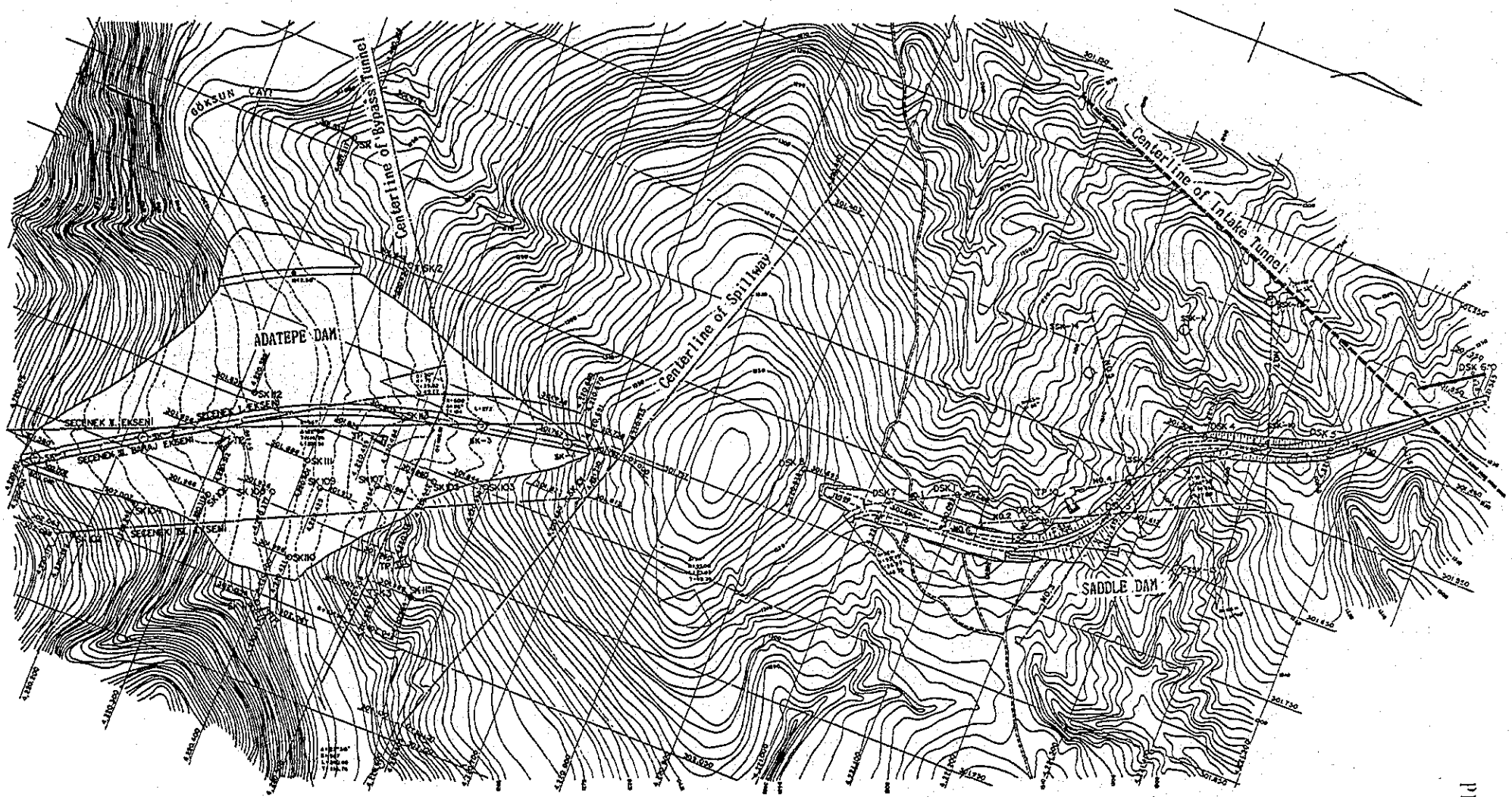
US$ 900 million (100% allocated by government)

Long Term Planning (1989)

According the the 6th five year plan approved by the national legislature in June 1989, total government outlay during the said 5 year period is TL 155.4 trillion. Of this, 7.9% is earmarked for the agricultural sector. Principal targets in the sector are development of the southeast Anatolia region and promotion of irrigation projects.

Appendix-II

Geology



I - II

II - I

LEGEND

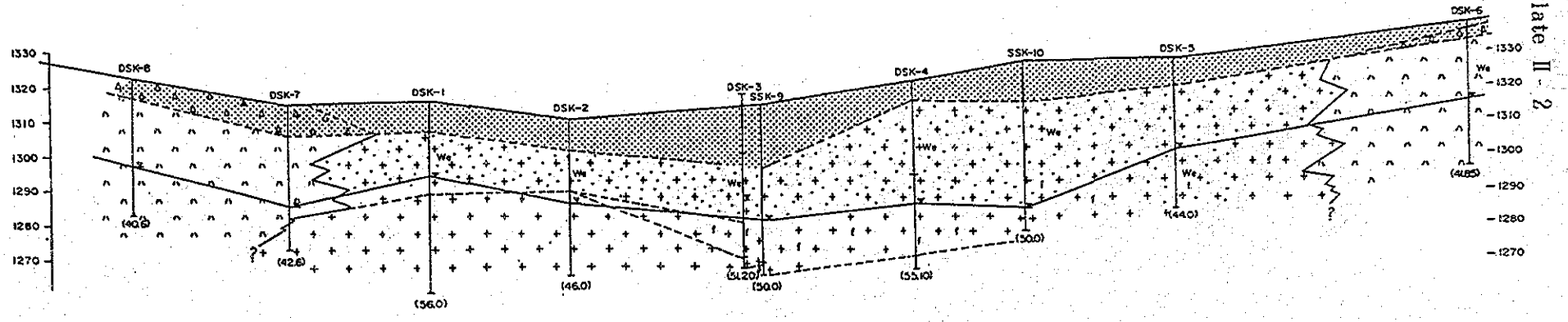
◇ Drilled in 1989

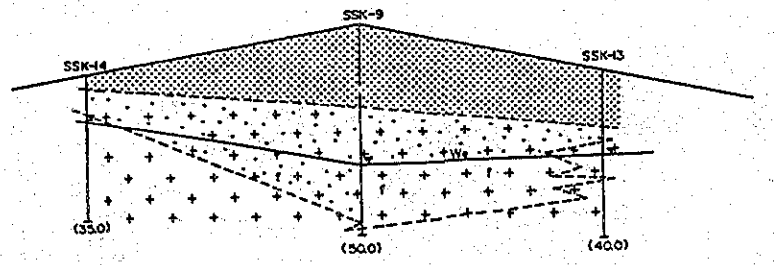
--- Line for Seismic Prospecting

—— Trench

Location of Geological Survey

Plate II - 1





L E G E N D

- Sand
- Weatherd Granodiorite
- Heavily Fractured Granodiorite
- Granodiorite
- Talus Cone
- Gabbro - Peridotite
- Ground Water Level

Geological Profile of Saddle Dam

Boring Test Results At Saddle Dam

Plate Ⅱ - 3
Sheet 1

Drilling. No. SSK-9 (NO.1)
Elevation. 1315.45
Water Level. 33.80

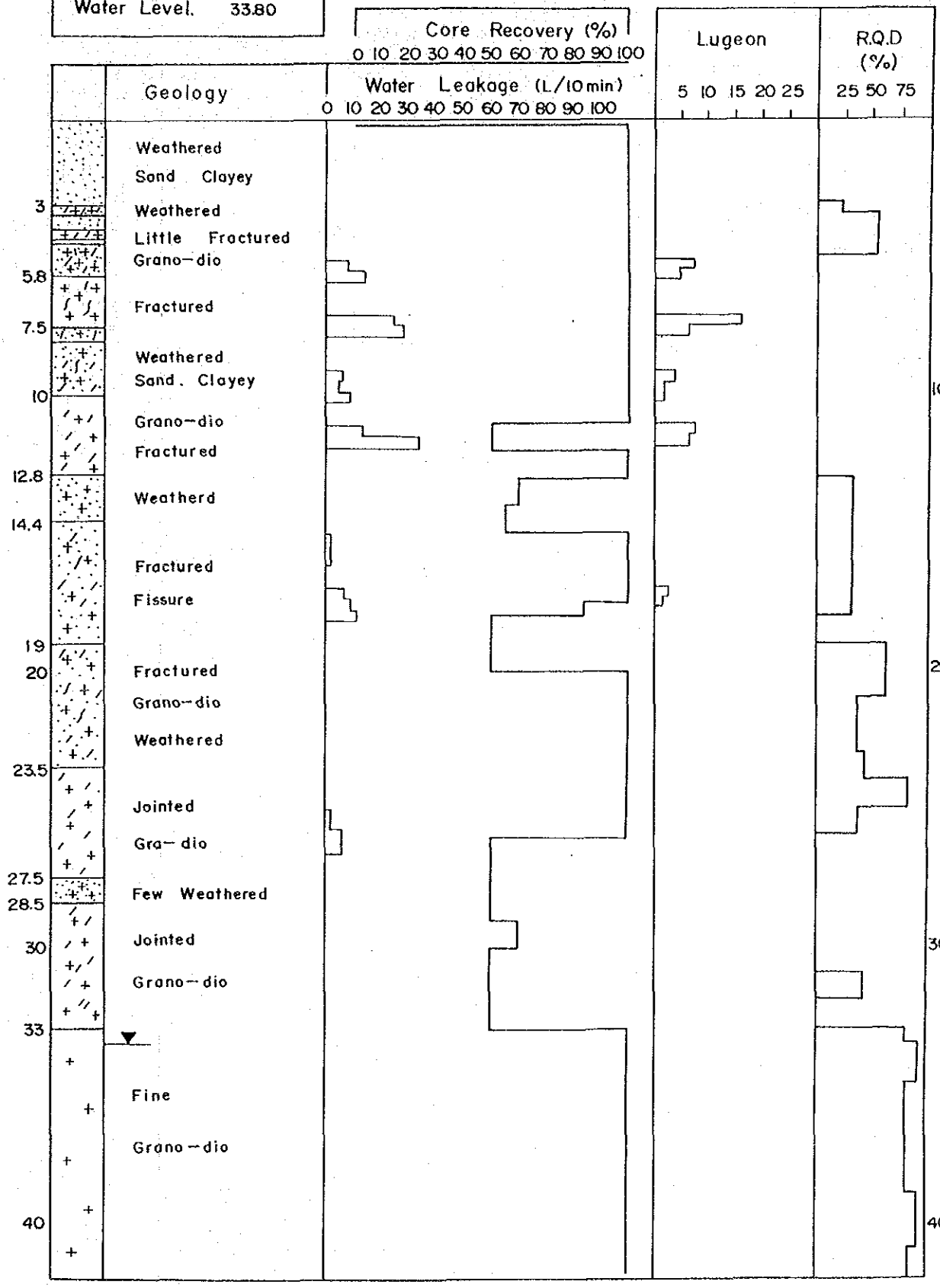


Plate Ⅱ - 3
Sheet 2

Drilling. No. SSK-9 (NO. 2)
Elevation. 1315.45
Water Level. 33.80

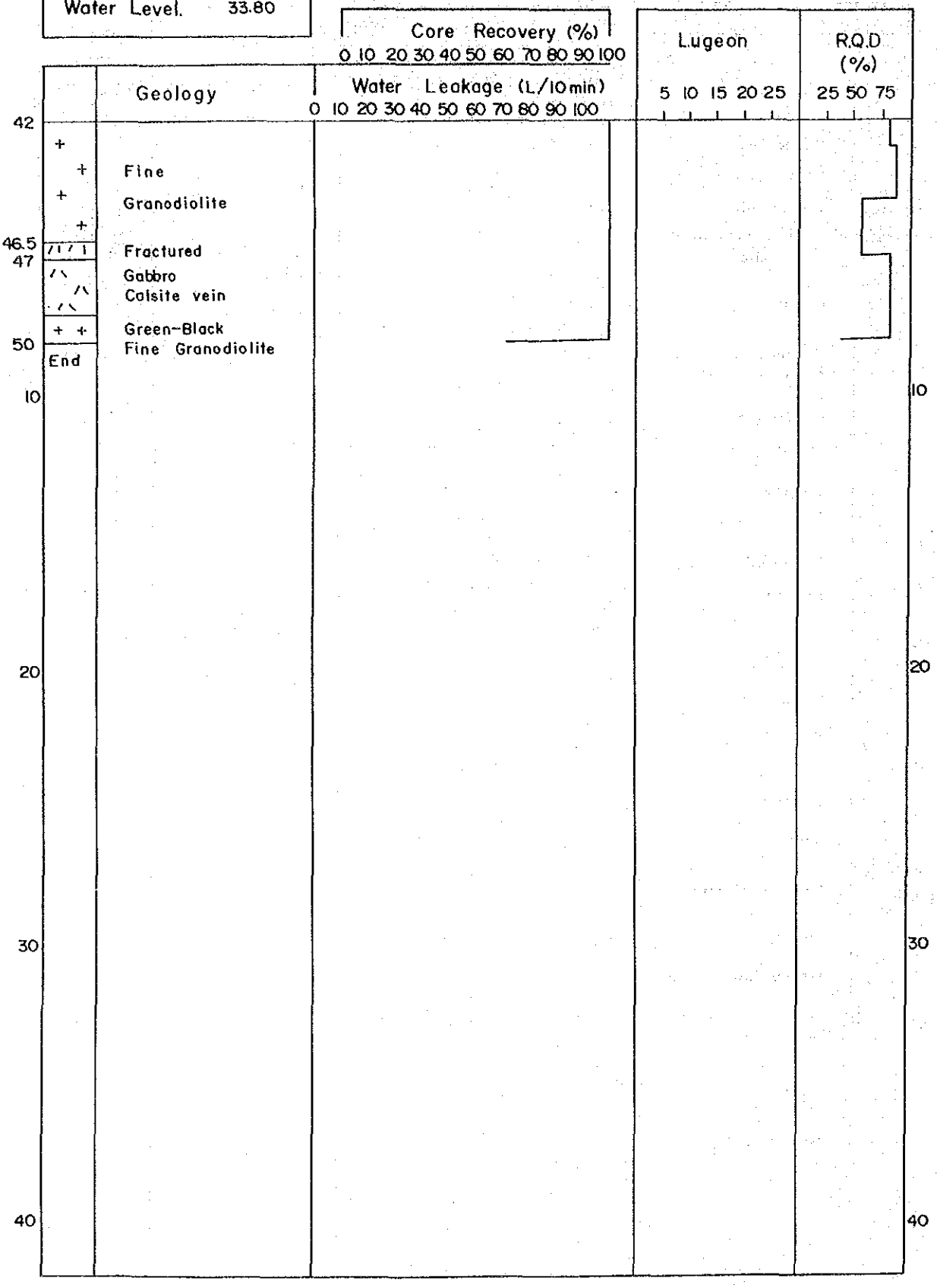


Plate Ⅱ - 3
Sheet 3

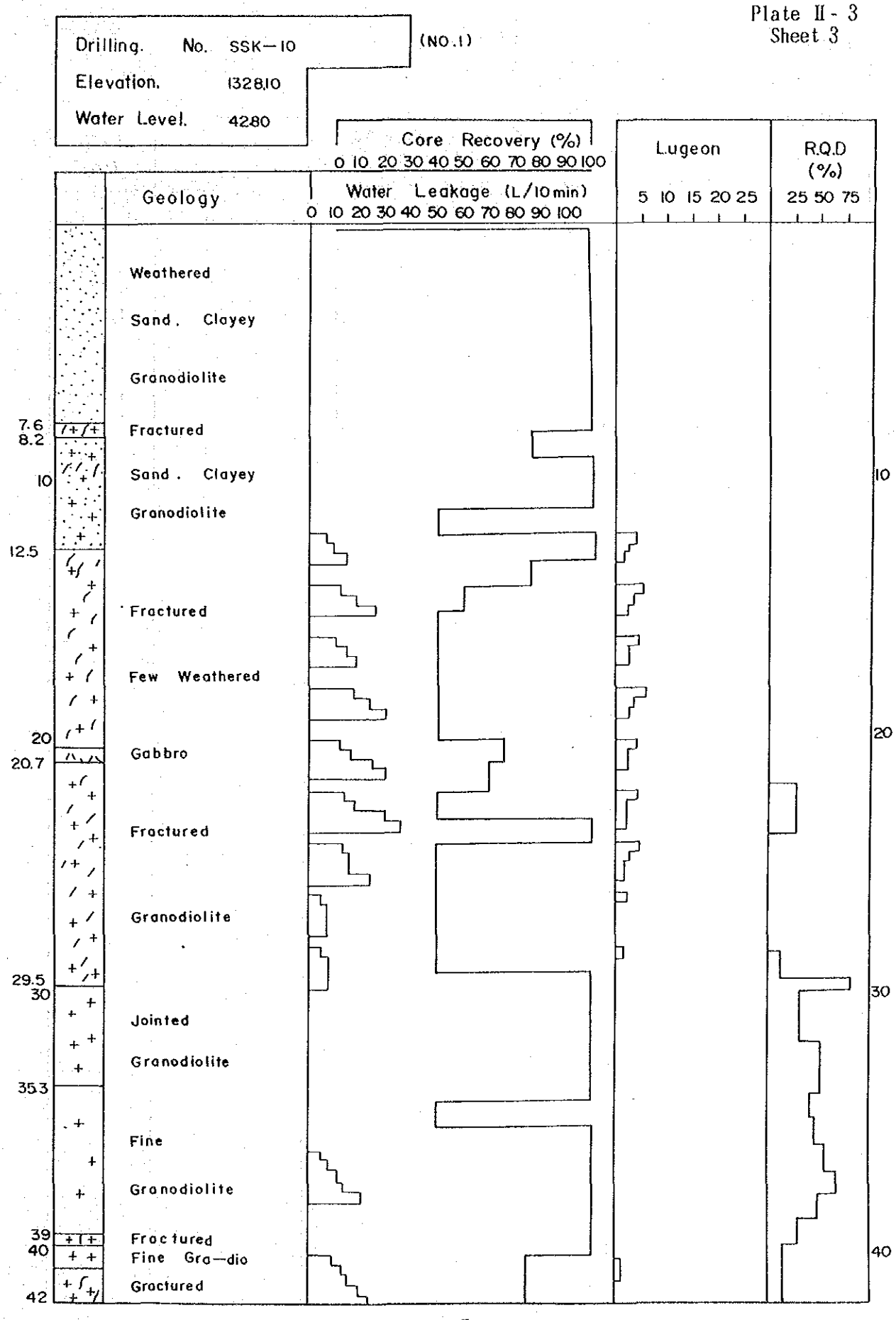
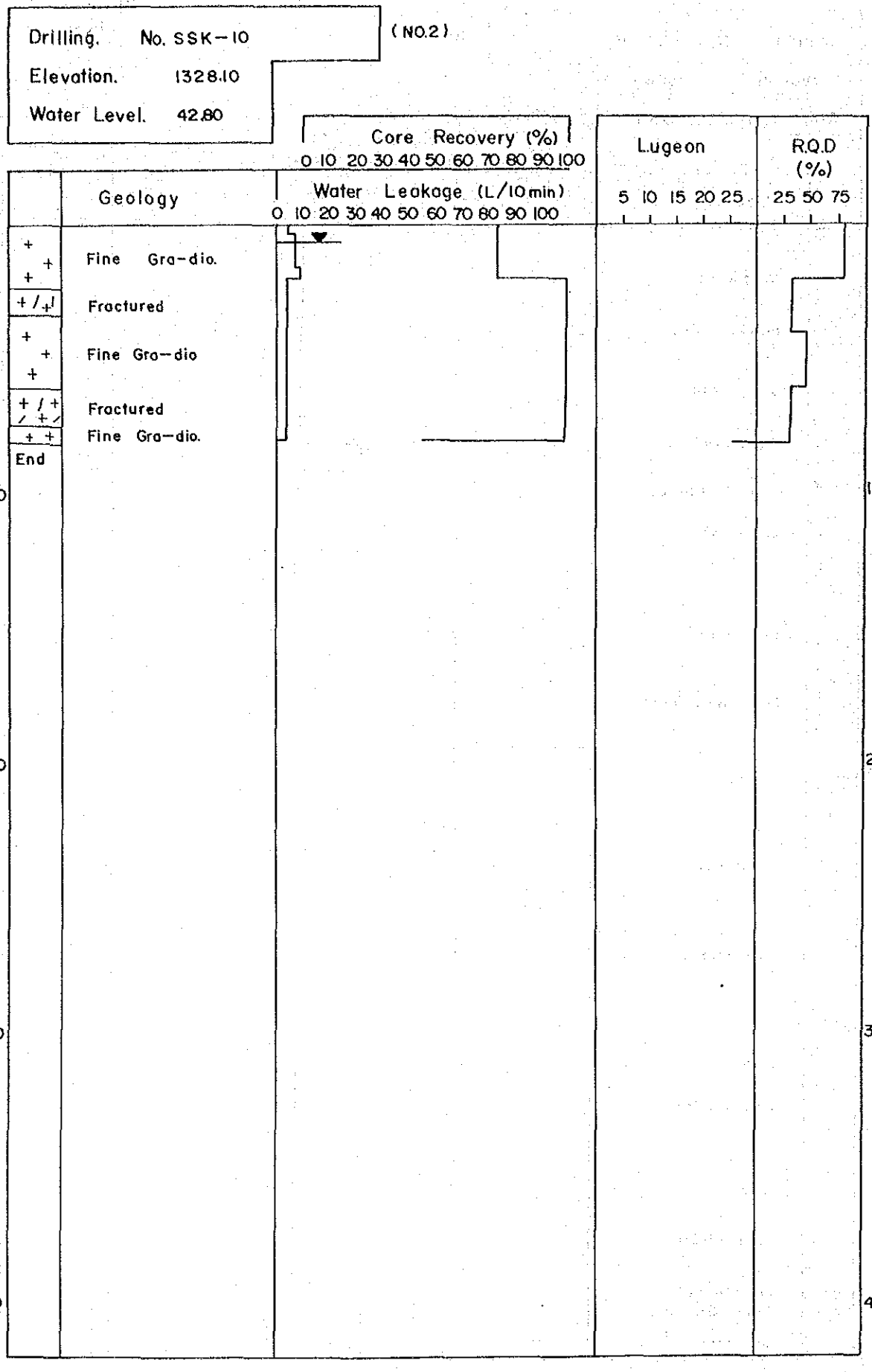


Plate Ⅱ- 3
Sheet 4



Drilling. No. SSK - 11
Elevation. 1296.80
Water Level. 17.20

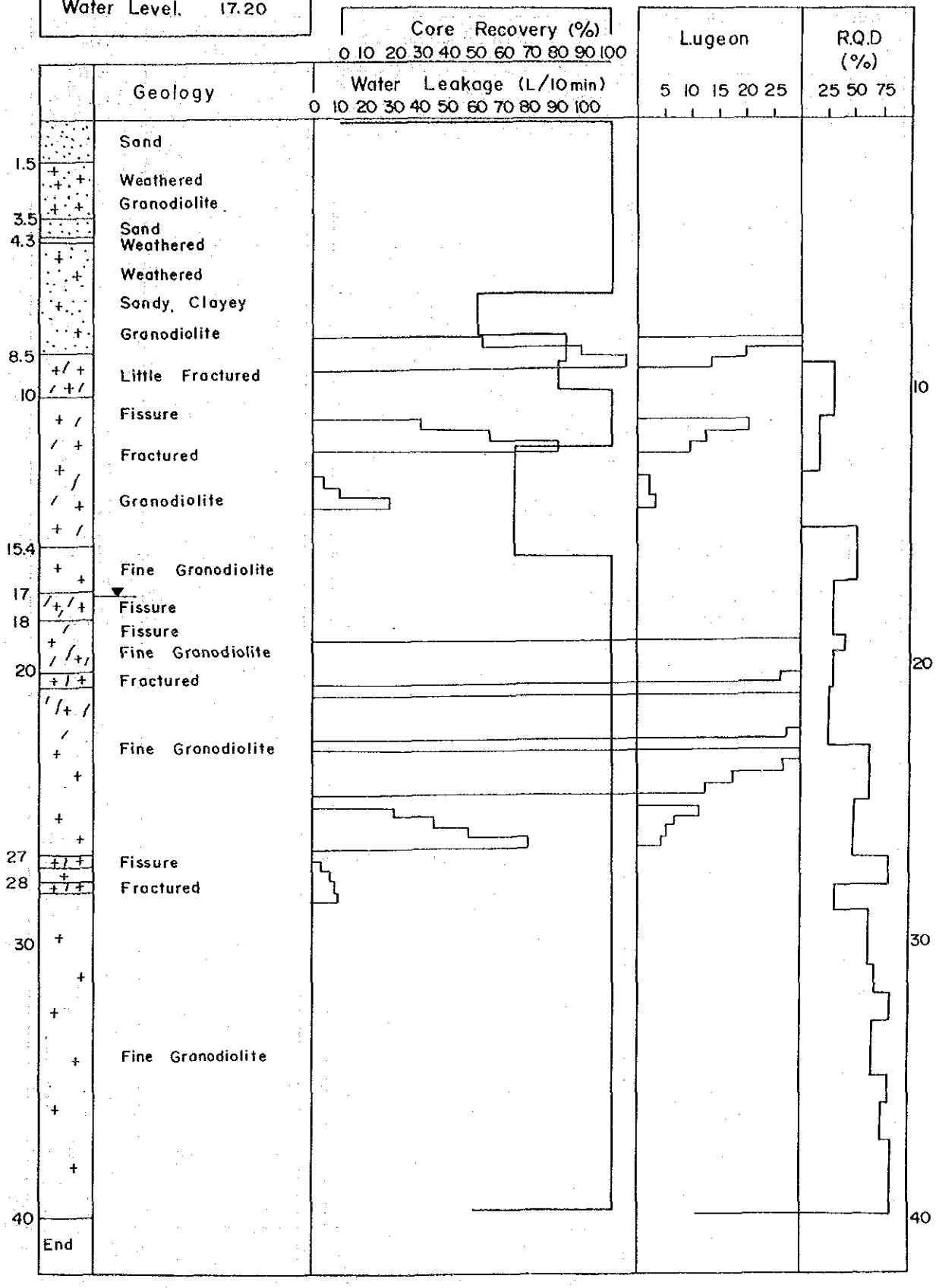
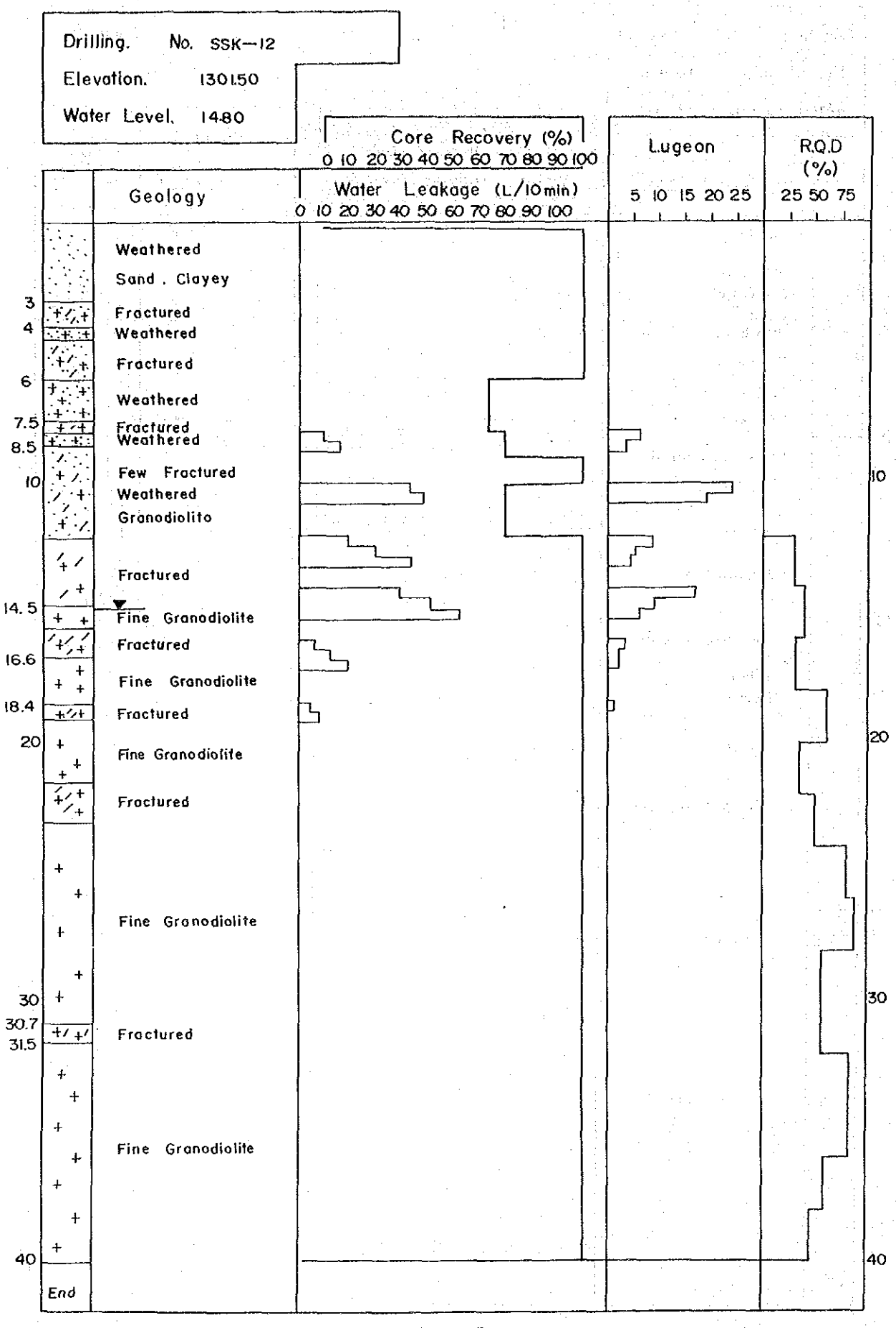


Plate Ⅱ - 3
Sheet 6



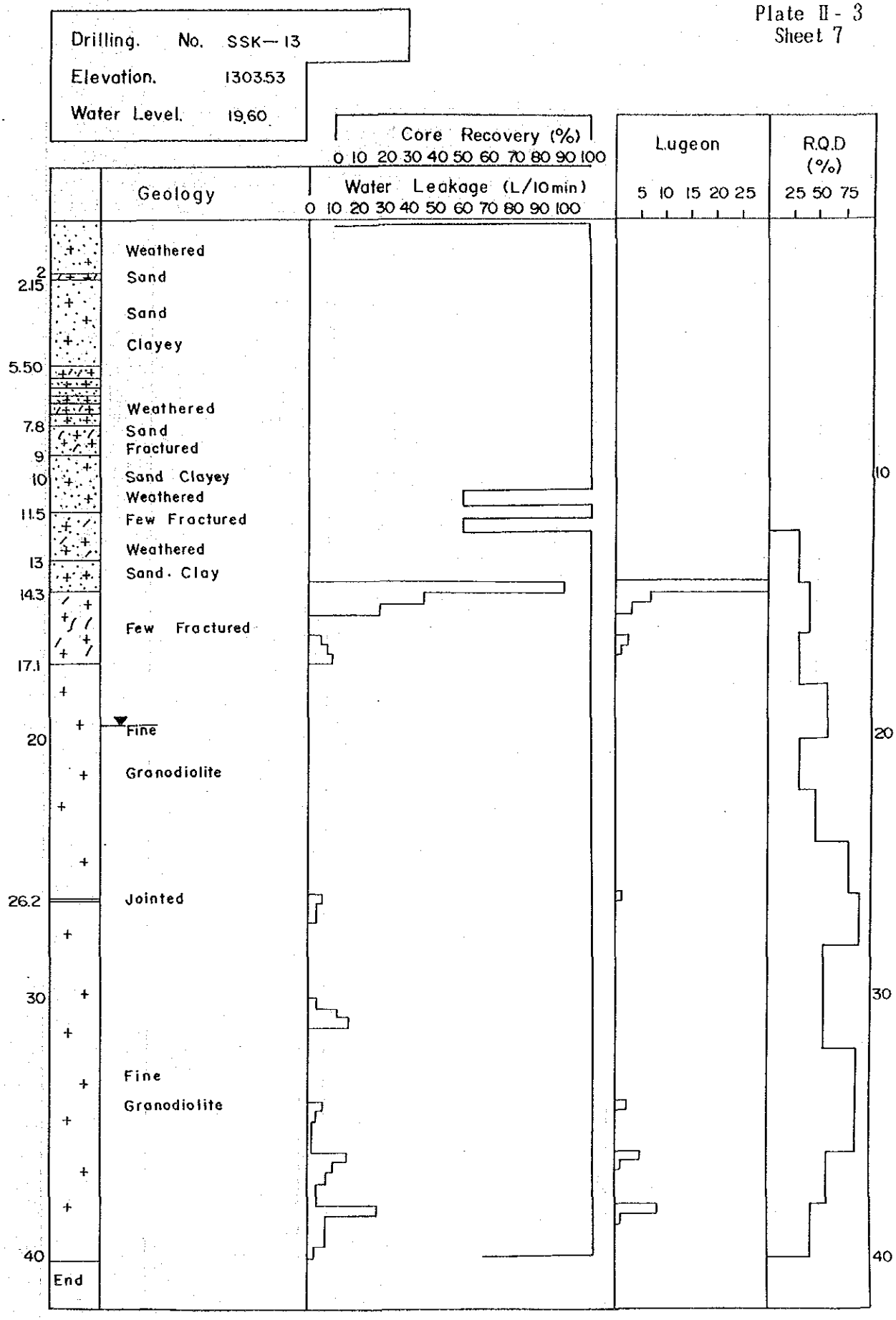
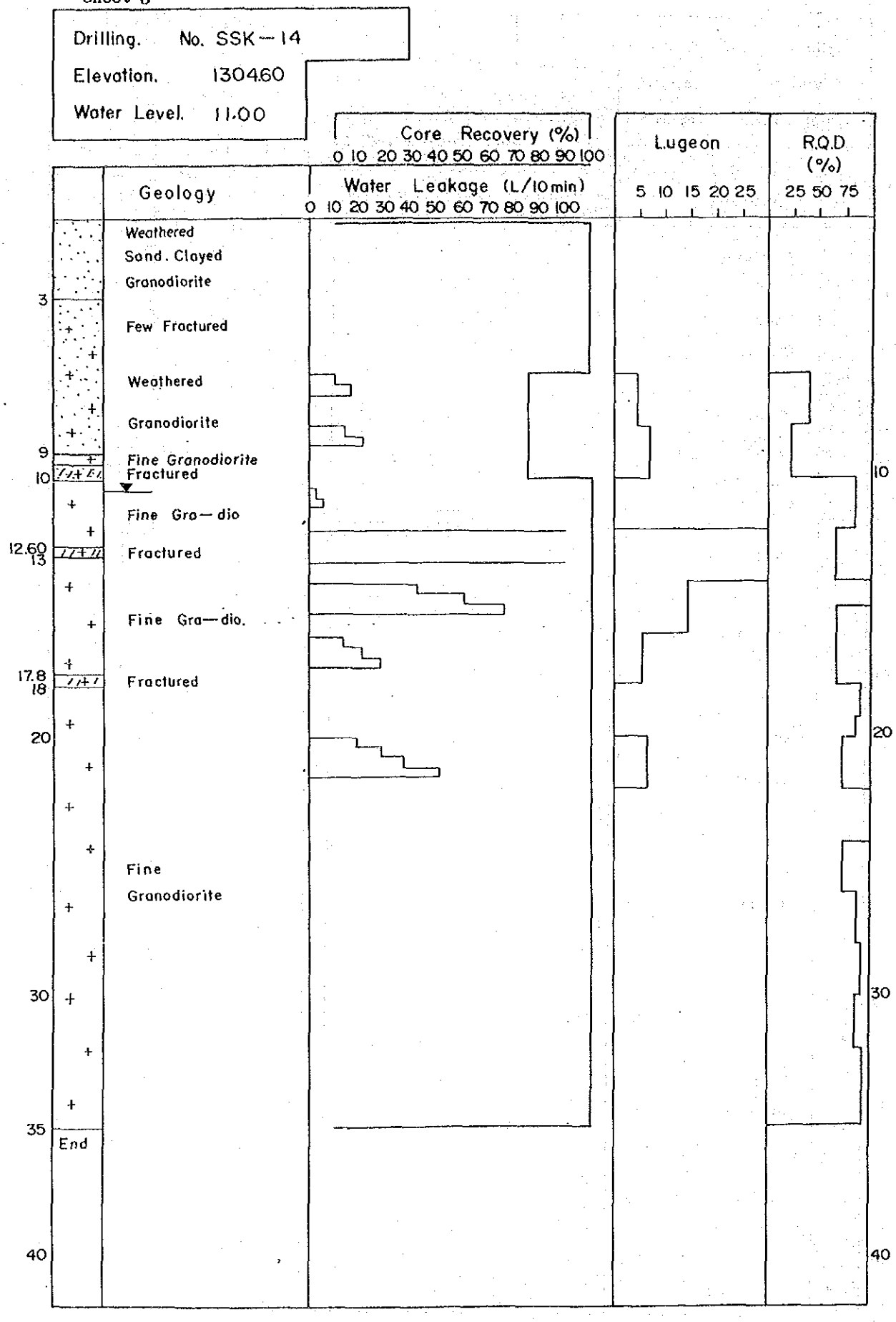
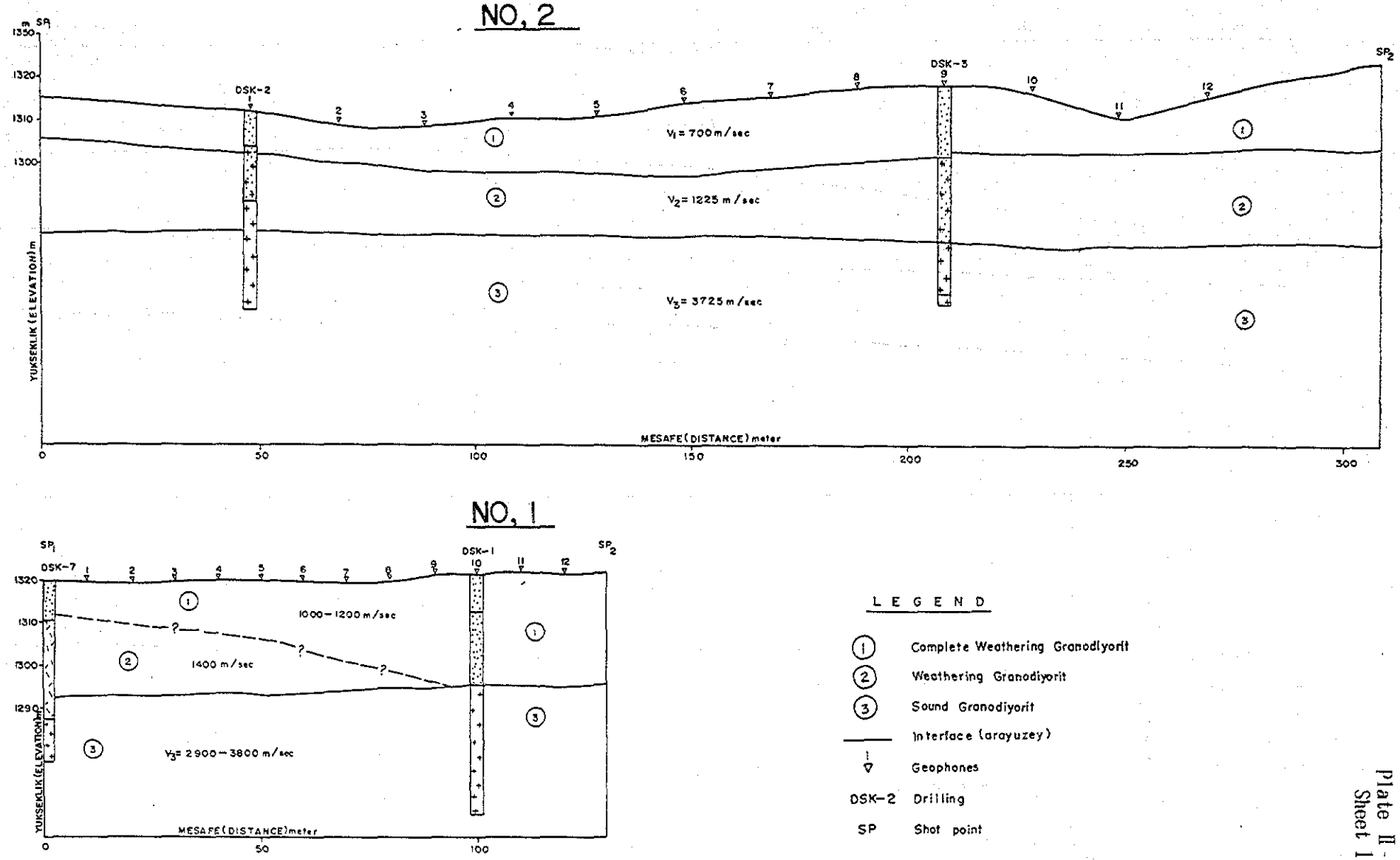
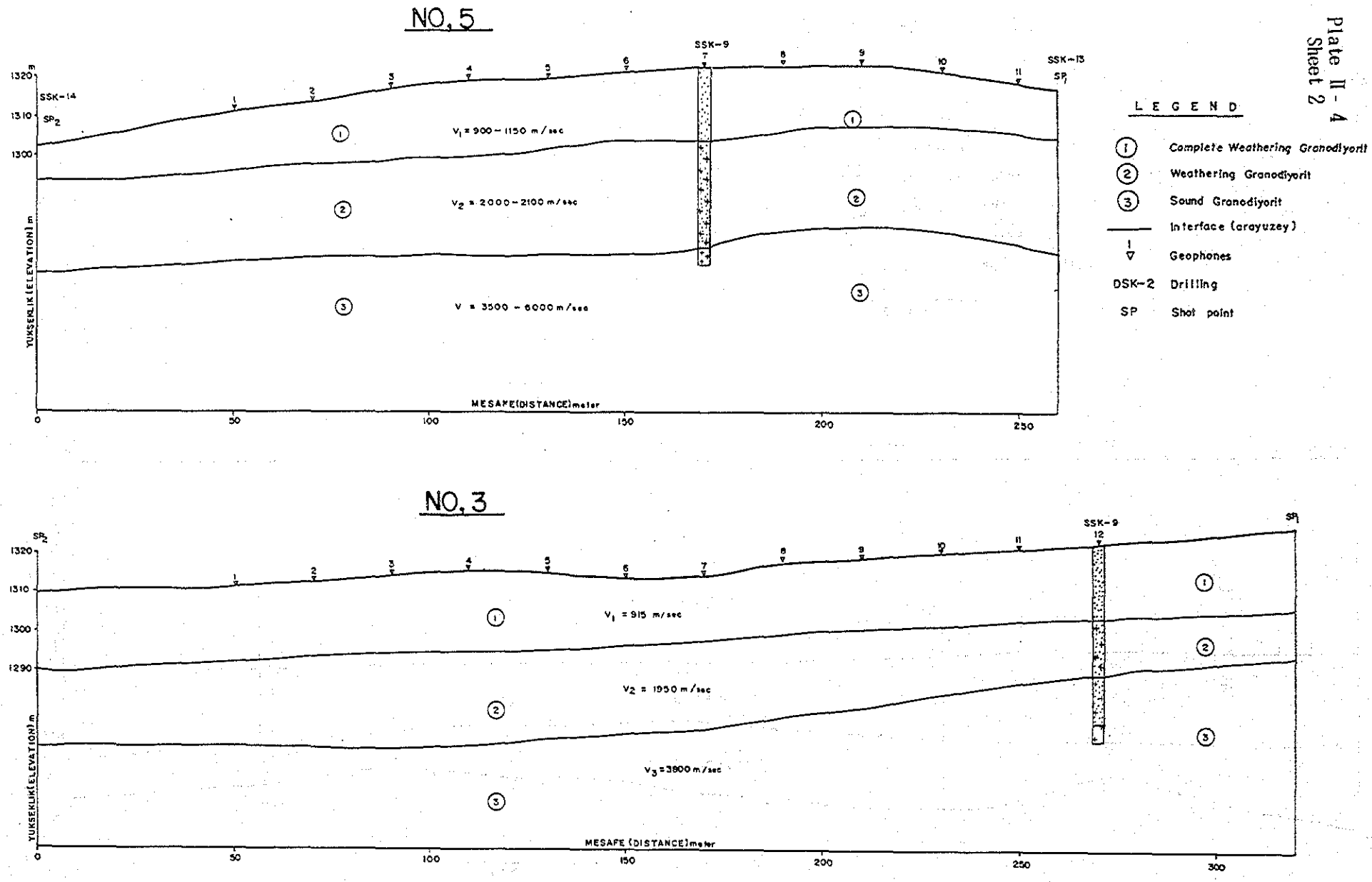

Drilling. No. SSK-13
Elevation. 1303.53
Water Level. 19.60
Core Recovery (%)
0 10 20 30 40 50 60 70 80 90 100
Lugeon
5 10 15 20 25
R.Q.D (%)
25 50 75
Geology
Water Leakage (L/10min)
0 10 20 30 40 50 60 70 80 90 100
Weathered
Sand
2
2.15
Sand
Clayey
5.50
Weathered
7.8
Sand
Fractured
9
10
Sand Clayey
Weathered
11.5
Few Fractured
Weathered
13
Sand. Clay
14.3
Few Fractured
17.1
Fine
20
Granodiolite
26.2
Jointed
30
Fine
Granodiolite
40
End
10
20
30
40

Plate Ⅱ- 3
Sheet 8

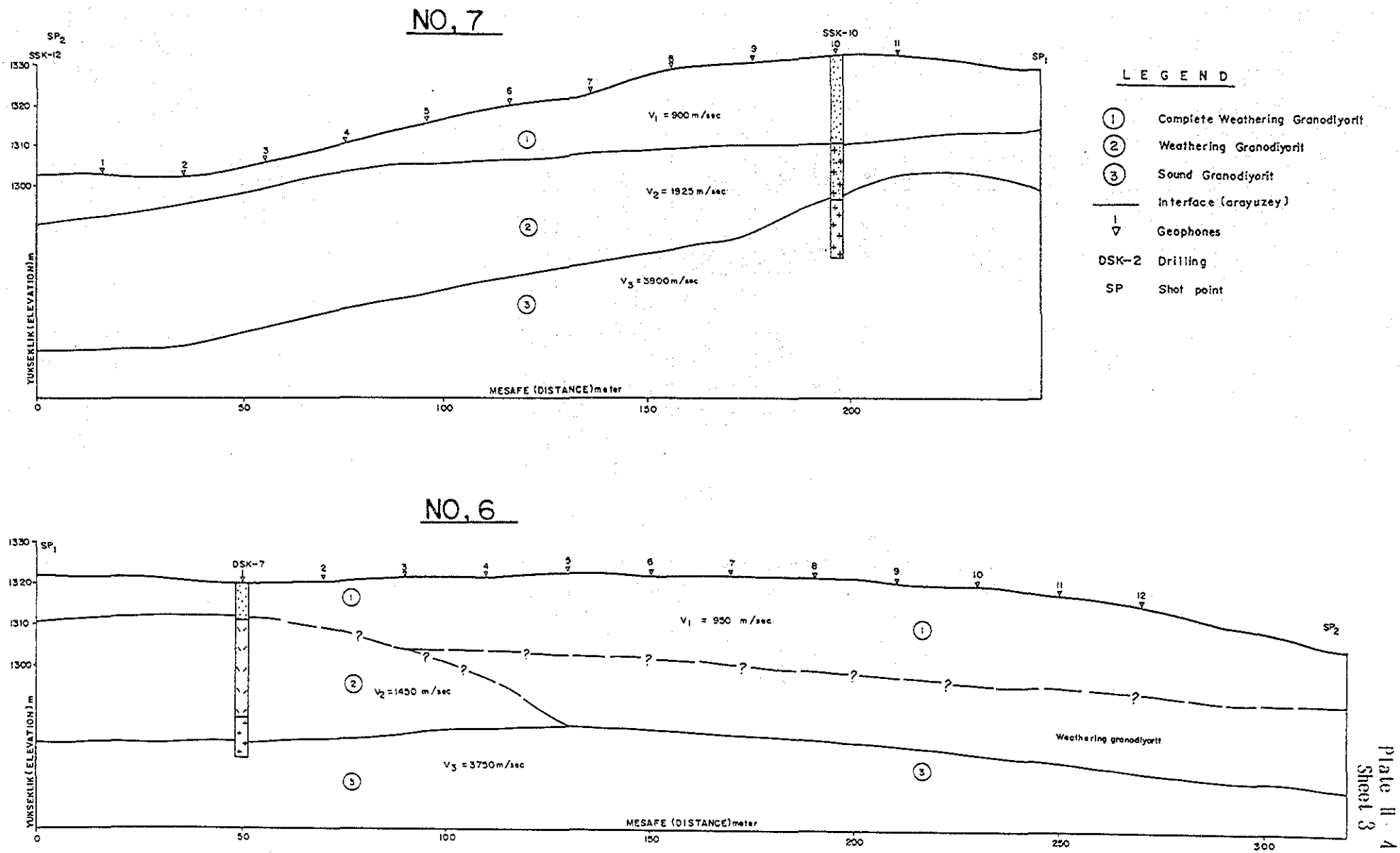




Seismic Refraction Cross Section at ADATEPE Dam (Sheet 1 of 3)



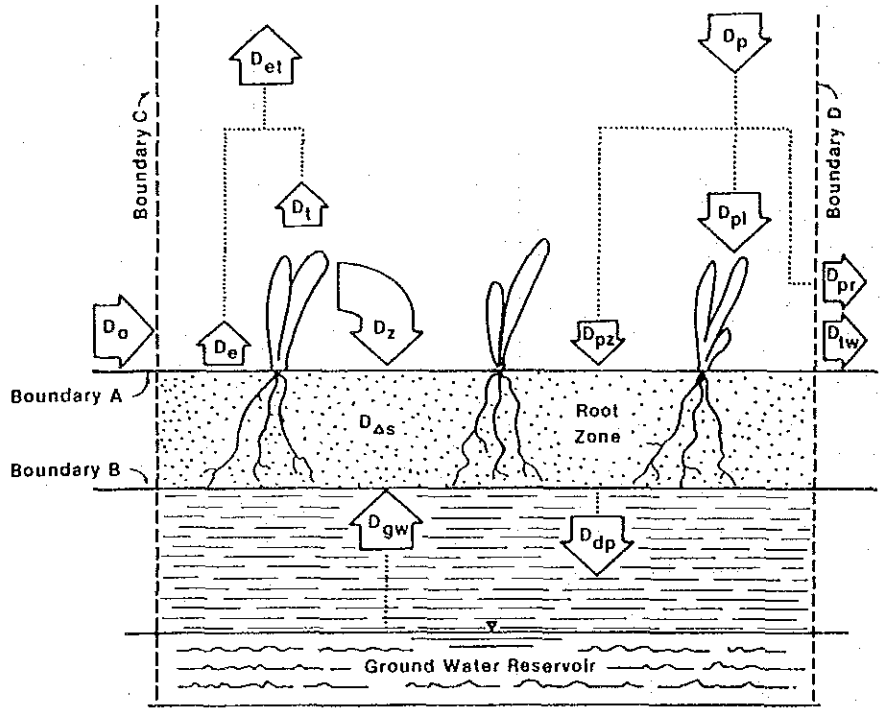
Seismic Refraction Cross Section at ADATEPE Dam (Sheet 2 of 3)



Seismic Refraction Cross Section at ADATEPE Dam (Sheet 3 of 3)

II-13

Plate II-4
Sheet 3


D_{et}
D_p
Boundary C
Boundary D
D_t
D_{pl}
D_{pr}
D_{tw}
D_o
D_e
D_z
D_{pz}
Boundary A
Boundary B
$D_{\Delta s}$
Root Zone
D_{gw}
D_{dp}
Ground Water Reservoir

Appendix-III

Hydrology

Ⅲ-1 Study on the Water Balance Among the Adatepe and It's Related Projects

1. Current River Discharge

The total mean annual discharge for the 5 sites related to the Project are as shown in Table 1-1 and Fig. 1-1.

Table 1-1 River Discharge (Annual Mean)

(Unit: MCM)

River	Location		Discharge
Goksun	2006	Karaahmet	296.1
Goksun	2009	Poskoflu	417.3
Hurman	2015	Tanir	254.6
Hurman	2007	Kuskayasi	260.6
Ceyhan	2005	Akcil	861.9
Ceyhan	(2005+2009)		1,279.2

From Table 1-1, it can be seen that total annual mean discharge for the Göksun river is $417.3\times10^6m^3$, $260.6\times10^6m^3$ for the Hurman river and $1,279.2\times10^6m^3$ for the Ceyhan river below its confluence with the Göksun river. Discharge is $1,603.0\times10^6m^3$ at Kandil dam at the lowermost point of the upperstream section of the Ceyhan river according to the master plan study.

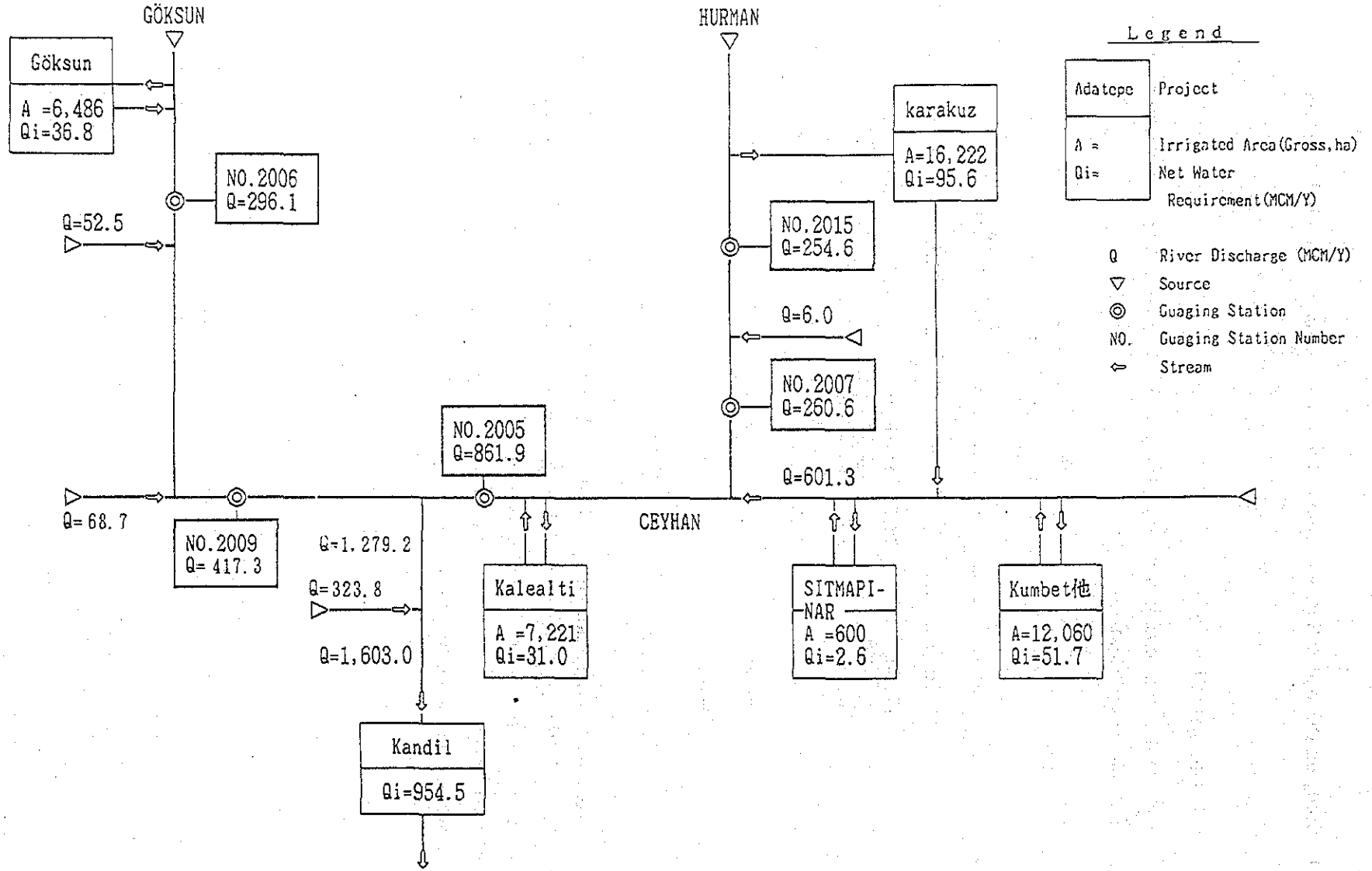


Fig.1-1 Schematic Pattern of Current River Discharge and Related Projects

2. Water Use on Related Projects

Six related projects in the vicinity draw water from the rivers to be used as water sources for the subject Project:

Göksun project: Irrigation project located at the upstream of the Project; water source is the Göksun river; construction completed; in operation since 1987.

Karakuz project: Irrigation project located at upstream of Hurman river; water source is Hurman river; currently feasibility study is under revision.

Kalealti project: Irrigation project drawing water from Ceyhan river just below confluence with Hurman river; construction begun in 1985 and still in progress; total construction period is 12 years.

Sitmapinar project: Irrigation project drawing water from Ceyhan river just above confluence with Hurman river; currently at master plan stage.

Kümbet project: Irrigation project located along Ceyhan and Söğütlü rivers at west of Elbistan; currently at master plan stage.

Kandil project: Power project planned at lowermost point of upstream portion of Ceyhan river; planned construction period is 2002~2007.

Discharge amounts for the above projects are as shown in Table 1.2. Data for discharges was obtained from the following materials:

Göksun project: Upper Ceyhan, Elbistan-Afşin Plain, GÖKSUN Irrigation Planning Report, DSI

Karakuz project: Upper Ceyhan Basin, Karakuz Project, Elbistan-Afşin Plain Irrigation Planning Report, 1985, DSI

Kalealti project: Upper Ceyhan, Elbistan-Afşin Plain, Kalealti Pump Irrigation Planning Report, 1981, DSI

Sitmapinar, Kümbet and Kandil projects: Water Resource Development, Ceyhan Projects, Master Plan, 1966, IECO

Table 1-2 Water Use in the Related Projects

PROJECT	IRRIGATED AREA(ha)		UNIT DUTY OF WATER (m^3 /ha/y)	TOTAL DUTY OF WATER (MCM/y)	REPEATING USE OF WATER(MCM/y)
	GROSS	NET			
KARAKUZ	16,222	14,600	6,547.68	95.6	19.1
GÖKSUN	6,486	5,840	6,307.48	36.8	7.4
KALEALTI	7,221	6,499	4,762.93	31.0	6.2
SITHAPINAR	600	540	〃	2.6	0.5
KUMBET	12,060	10,854	〃	51.7	10.3
KANDIL	ELECTR POWER : 55MW			954.5	------

NOTE:Repeating Use of Water is 20% of total water amount required.
:Unit Water requirment for SITHAPINAR and KUMBET PROJECTS is same as for KALEALTY PROJECTS.

Based on the above, the water balance among the Adatepe and its related projects can be expressed as shown in Fig. 1-2.

3. Constraints on Water Availability for the Project

Locational relationship between the Project and other related projects in the vicinity is as shown in Fig. 1-1. Amount of discharge diverted for the Göksun project located upstream of the Project directly affects water availability for the Project. Karakuz, Kalealti and the other projects are mutually inter-related with the Project in terms of securing the design discharge for the Kandil project.

Furthermore, it is desirable to release a river maintenance discharge from Adatepe dam from the standpoint of river sanitation, preservation of fish resources and maintenance of river channel downstream.

Consequently, constraints on water availability for the Project comprise the following two points:

① Discharge required for the Project must be less than that at the dam site taking into consideration water diversion for the Göksun project. A maintenance flow downstream must also be secured.

② Water balance for the overall upper Ceyhan river segment must allow sufficient discharge for the downstream Kandil project.

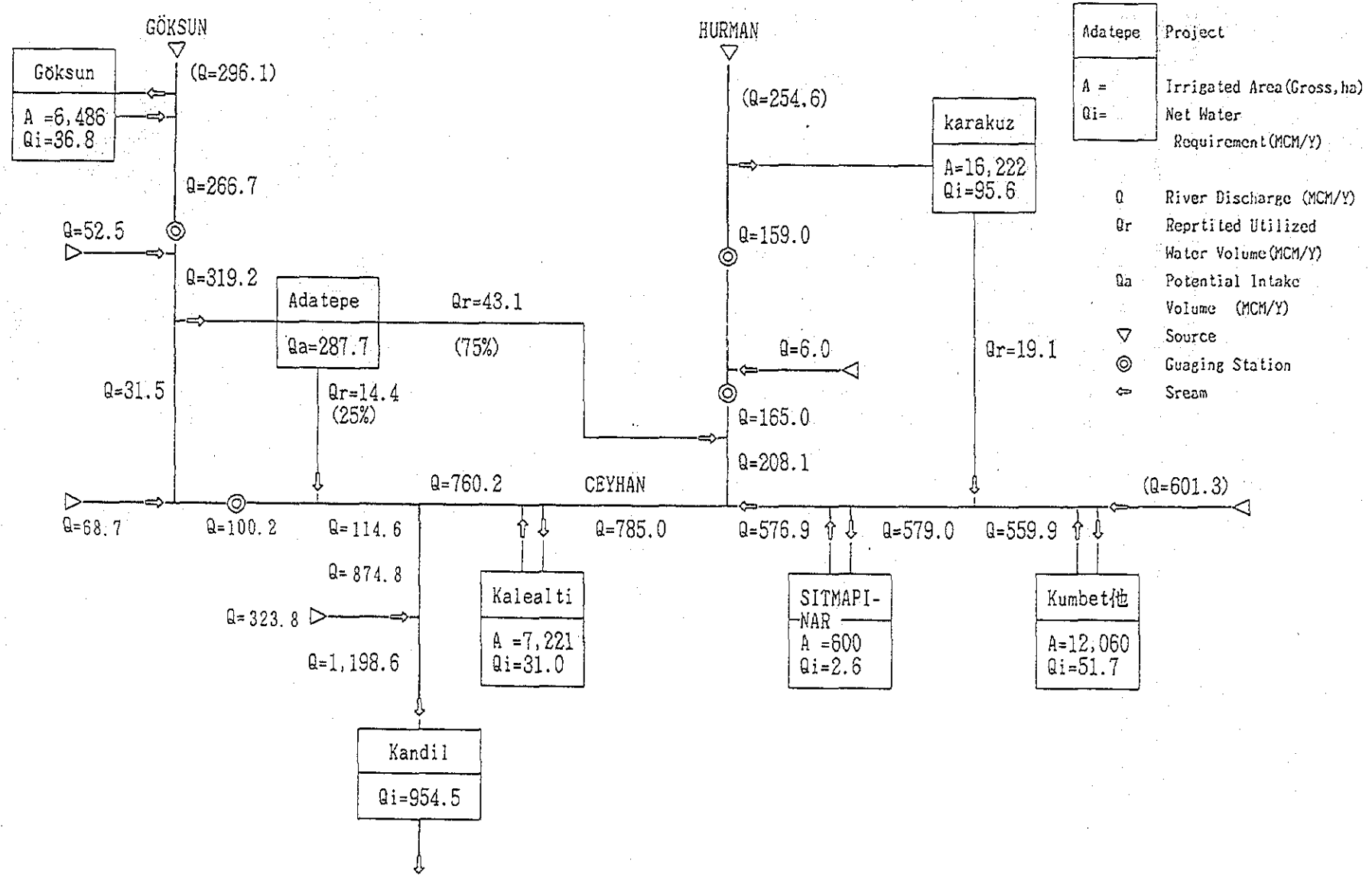


Fig.1-2 Schematic Water Balance Among the Adatepe and It's Related Projects

4. Available Discharge

i) Downstream Maintenance Flow

Annual minimum discharge at point 2006 immediately upstream of the Adatepe dam site is as shown in the Table 1-3. The approximate minimal discharge is adopted for the maintenance flow below Adatepe dam, and from the table this is around $1m^3/s$ ($31.5\times10^6m^3/y$).

Table 1-3 Minimum Discharge Record

Sequence	Ovseved Data	Min. Discharge
1	1973. 12. 19	1. 14 m^3/s
2	1972. 9. 8	1. 25
3	1964. 8. 22	1. 56
4	1974. 1. 3	1. 58
5	1983. 1. 19	1. 89

(2006 points, 1955 ~1984)

Available discharge for diversion :

Current river discharge - maintenance flow

$= 319.2 - 31.5$

$= 287.7 \times 10^6 m^3/y$

ii) *Discharge for Kandil Project*

Kandil is a hydropower project assuming 954.5 m^3/y of discharge at Kandil dam. Available discharge at Adatepe dam is computed based on allowance for sufficient downstream discharge for Kandil project.

Table 1-4 Estimation of Available Water at Adatepe Dam Site

(Unit: MCM)

	Intake Water Volume	Water Volume Used Repeatedly	Water Volume Consumed
Goksun	36. 8	7. 4	29. 4
Karakuz	95. 6	19. 1	76. 5
Kalealti	31. 0	6. 2	24. 8
Sitmapinar	2. 6	0. 5	2. 1
Kumbet	51. 7	10. 3	41. 4
Adatepe	(Q)	(0. 2*Q)	(0. 8*Q)
Total	217. 7+Q	43. 5+0. 2Q	174. 2+0. 8Q

From the above table, available discharge at Adatepe dam is:

$Q = 592.9 \times 10^6 m^3/y$

Formula for calculation is:

Current river discharge - (diverted discharge - return discharge) =

Kandil design discharge

$1,603.0 - 174.2 + 0.8Q = 954.5$

$Q = 592.9 \times 10^6 m^3/y$

iii) Available Discharge

Available discharge at Adatepe dam is the smaller of the two values in i) and ii) above:

Downstream maintenance flow = $287.7 \times 10^6 m^3/y$

Kandil design discharge = $592.9 \times 10^6 m^3/y$

Further considering evaporation loss from the reservoir surface, and seepage loss at a total of 5%, effective available discharge is:

$273.3 \times 10^6 m^3/y$

iv) Irrigable Area under the Project

Irrigable area is calculated from available discharge and unit irrigation requirement. The unit irrigation requirement in average is $6,055 m^3$/ha (see Appendix-VI).

Thus, irrigable area = available discharge (m^3) / unit water requirement (m^3/ha)

$= 273.3 \times 10^6 / 6,055$

$\doteq 45,136$ha

The irrigable area for the Adatepe Project is accordingly computed at about 45,000ha. If road/canal density of 10% is taken into consideration, the total is around 50,000ha.

III-2 Method and Results of Reservoir Water Balance Calculations

(1) Method

Fluctuation in reservoir volume was calculated according to the following formula on the basis of monthly discharge data for the period 1955-1988.

$$V_i = V_{i-1} + I_i - O_i$$

Where:

V_i :	Reservoir volume (m^3)
V_{i-1} :	Previous month reservoir volume (m^3)
I_i :	Inflow volume (m^3)
E_i :	Evaporation volume (m^3)
O_i :	Irrigation volume (m^3)

(2) Results

Using the above formula, optimum reservoir scale was determined on the basis of the irrigation requirement calculated for the design cropping pattern. Results are indicated in Fig. 2-1 and Fig. 2-2. The results given in Fig. 2-1 (Case-1) were obtained considering the yearly change of water requirement and the results given in Fig. 2-2 (Case-2) were obtained without considering the yearly change of water requirement (Refer to Table 2-1). The data used in Case-1 study were utilized to decide the capacity of the irrigation facilities.

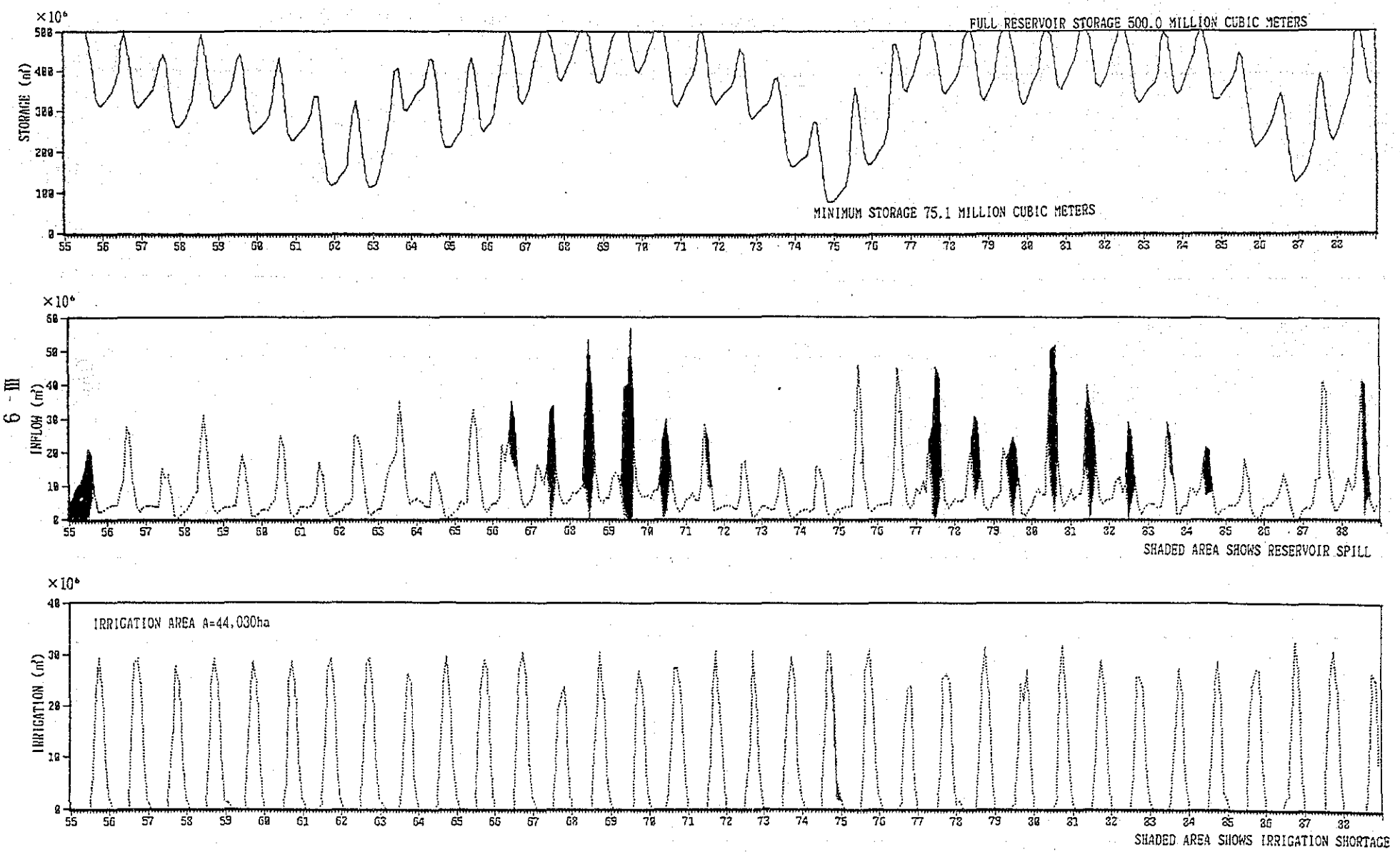


Fig.2-1 Water Balance Simulation Result of the Proposed ADATEPE Dam Reservoir (Case-1)

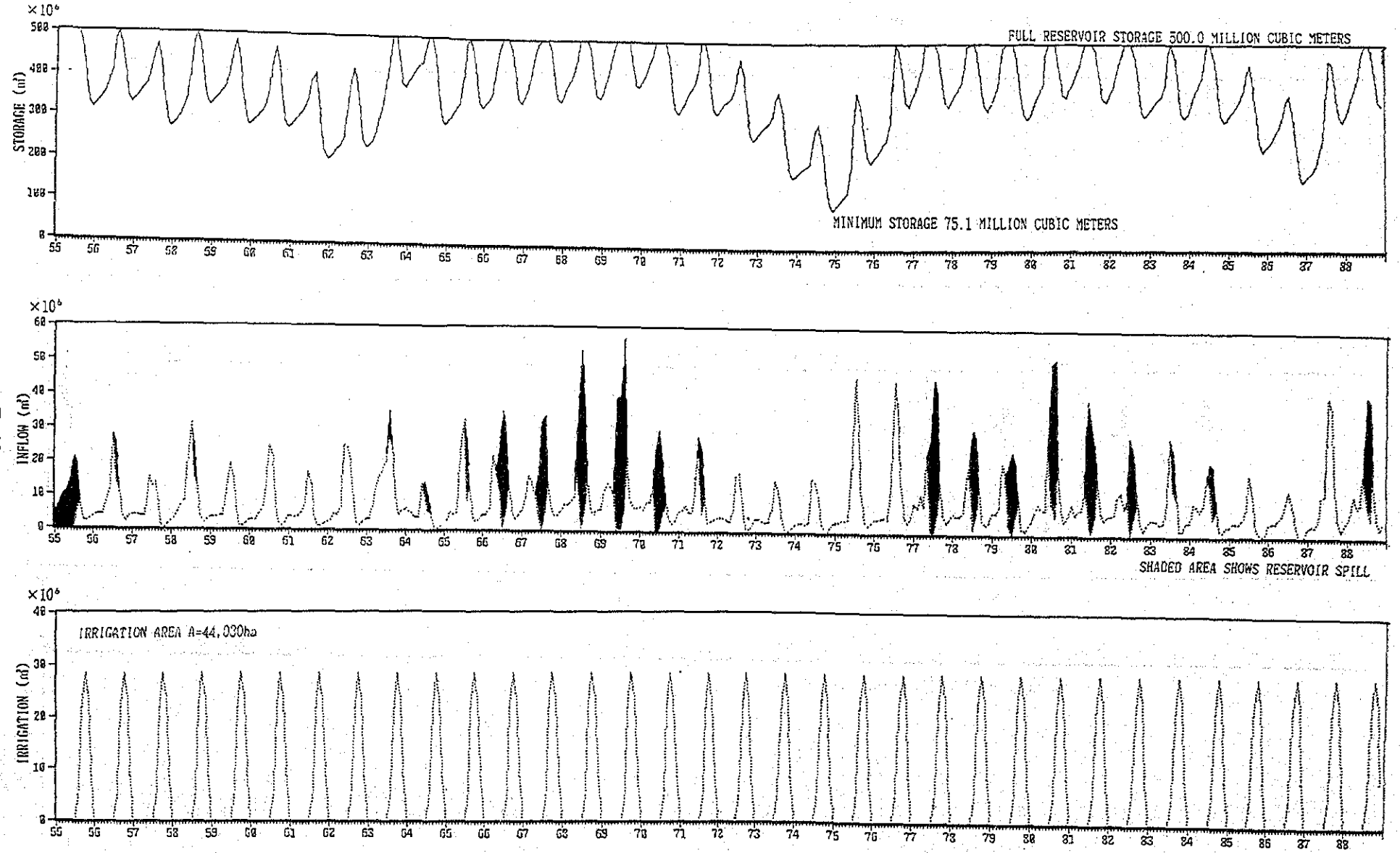


Fig.2-2 Water Balance Simulation Result of the Proposed ADATEPE Dam Reservoir (Case-2)

Table 2-1 Calculation of Water Requirement

CLIMATE DATA <Average of 1955-1988>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total/Avg
[t (c)]	10.30	14.40	18.90	22.70	21.90	16.70	10.90	4.30	-0.80	-4.00	-1.20	4.10	9.85
[p (%)]	8.90	9.93	9.97	10.12	9.48	8.38	7.80	6.81	6.64	6.85	6.78	8.33	100.00
[f (mm)]	114.29	146.08	167.14	187.26	172.00	132.15	102.23	68.72	51.57	43.17	51.41	83.37	1,314.39
[Rf (mm)]	52.60	45.40	18.00	4.00	3.90	8.00	36.30	42.90	48.30	49.10	38.40	53.50	400.40
[Er (mm)]	48.18	42.14	18.00	4.00	3.90	8.00	34.49	40.04	44.57	45.24	36.26	48.94	373.76

Water Requirement [Whole Area] Year> Av.1955-1988

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Crop Req. (mm/Month)	0.00	0.00	0.00	0.00	20.63	84.08	113.38	94.92	31.84	0.28	0.00	0.00	345.12
On Farm Req. (mm/Month)	0.00	0.00	0.00	0.00	34.38	140.13	188.97	158.19	53.06	0.46	0.00	0.00	575.20
(M3/H)	0.00	0.00	0.00	0.00	343.85	1,401.30	1,889.65	1,581.92	530.61	4.62	0.00	0.00	5,751.96
On Cannal Req. (mm/Month)	0.00	0.00	0.00	0.00	36.19	147.51	198.91	166.52	55.85	0.49	0.00	0.00	605.47
(M3/H)	0.00	0.00	0.00	0.00	361.94	1,475.05	1,989.11	1,665.18	558.54	4.87	0.00	0.00	6,054.69
Module (l/sec./h)	0.00	0.00	0.00	0.00	0.14	0.57	0.74	0.62	0.22	0.00	0.00	0.00	

*Water Requirement given in the above was calculated using mean rainfall and temperature data during 1955 to 1985.

(Result -1) Interpolation of Precipitation Data at TANIR Station

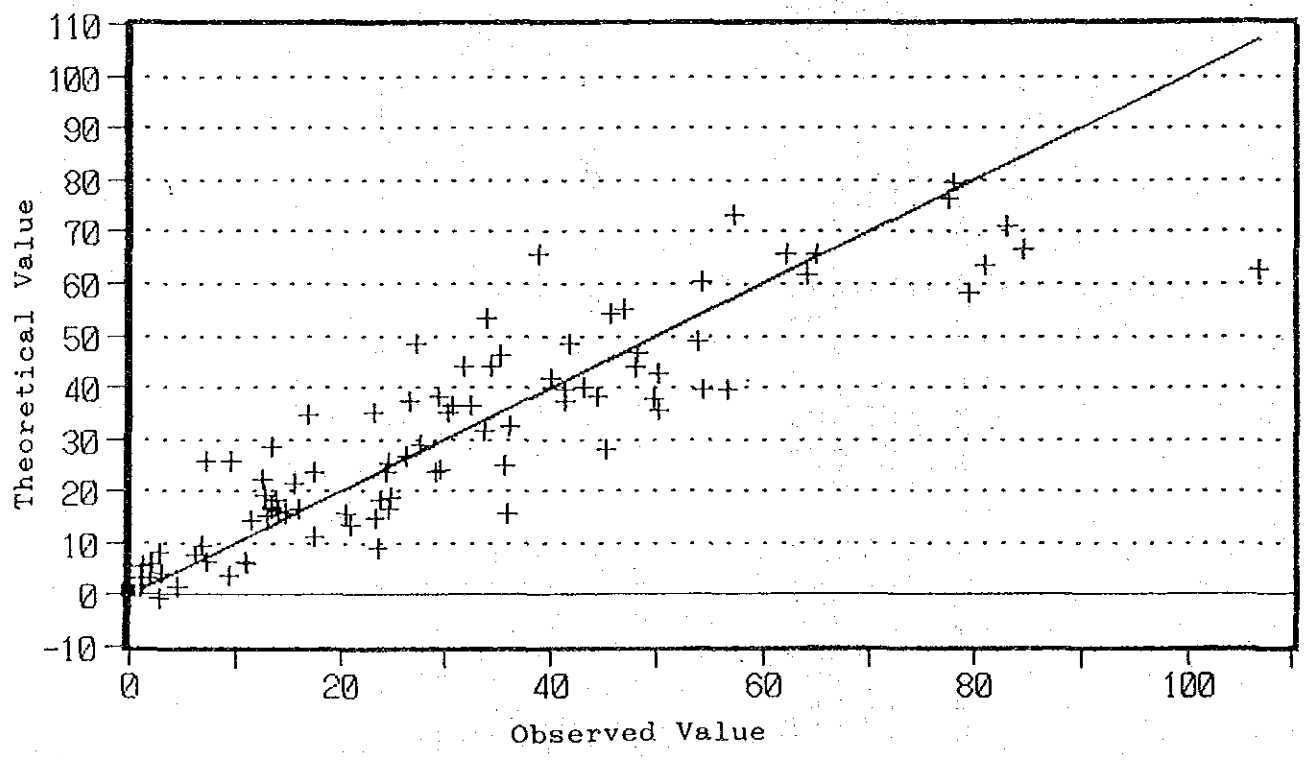
		Coefficient	T--Value	Power	Standard Deviation	95% Confidence Interval
	a0	-0.6840	-0.4372		1.56440	-3.7870 - 2.41889
Göksun	a2	0.10196	1.99047	5%	0.05122	0.00035 - 0.20357
Afşin	a4	0.27995	3.15399	1%	0.08876	0.10389 - 0.45600
Elbistan	a5	0.31657	5.06915	1%	0.06245	0.19270 - 0.44044

Standard Partial Regression Coefficient	
b2	0.20131
b4	0.37126

-Multiple Correlation Coefficient	0.91174
-Decision Coefficient	0.83128
-Decision Coefficient Regulated Free Ratio	0.82631
-Standard Deviation	9.94102

$$P_{Tanir} = a_0 + a_2 * P_{Goksun} + a_4 * P_{Afsin} + a_5 * P_{Elbistan}$$

Relationship between Observed Value and Theoretical Value
(Multiple Correlation Coefficient R=0.9117)



(Result -2) Interpolation of Precipitation Data at CARDAK Station

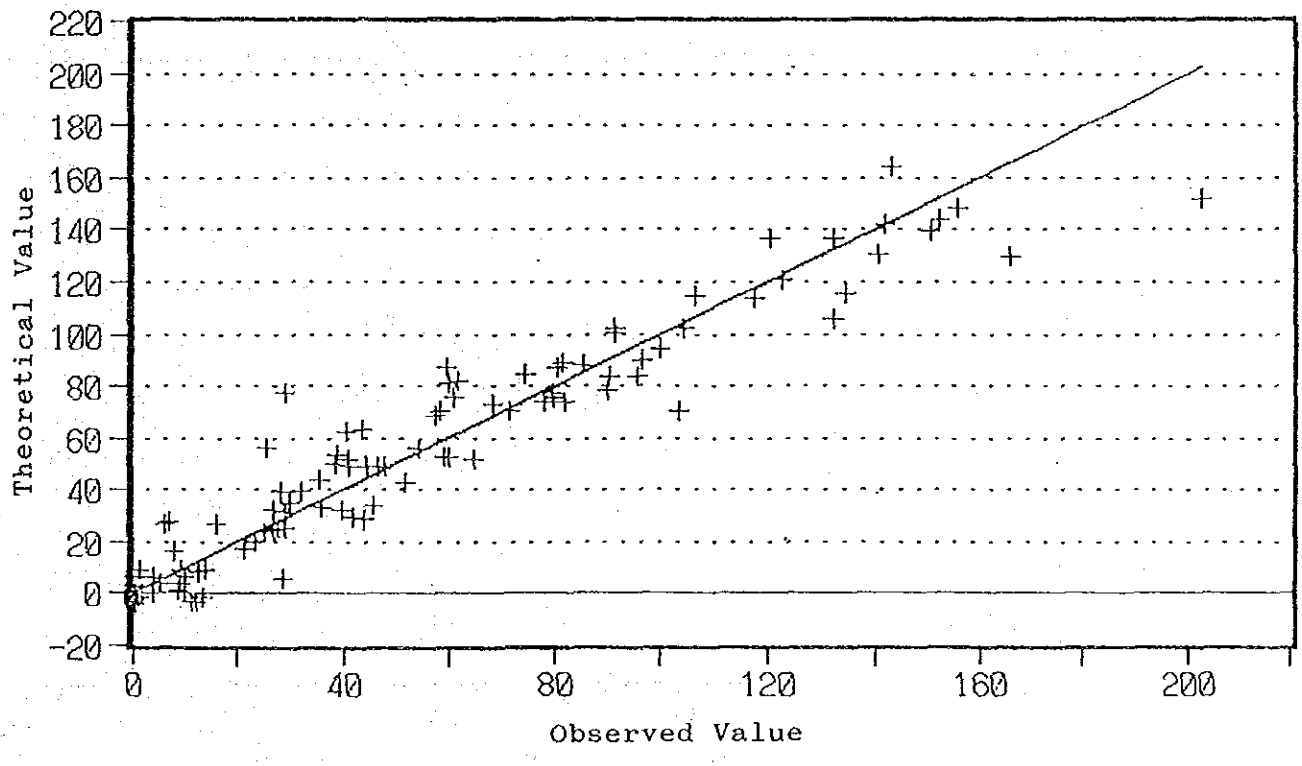
		Coefficient	T-Value	Power	Standard Deviation	95% Confidence Interval
	a0	-4.6522	-2.1781	5%	2.13592	-8.8885 - -0.4159
Afsin	a1	0.44170	3.64477	1%	0.12118	0.20134 - 0.68205
Elbistan	a2	0.45535	5.34043	1%	0.08526	0.28624 - 0.62446
Goksun	a6	0.45535	5.34043	1%	0.06994	0.29268 - 0.57011

Standard Partial Regression Coefficient	
b1	0.29643
b2	0.28205

-Multiple Correlation Coefficient	0.95888
-Decision Coefficient	0.91945
-Decision Coefficient Regulated Free Ratio	0.91708
-Standard Deviation	13.5727

$$P_{cardak} = a_0 + a_1 * P_{Afsin} + a_2 * P_{Elbistan} + a_6 * P_{Goksun}$$

Relationship between Observed Value and Theoretical Value
(Multiple Correlation Coefficient R=0.9589)



(Result -3) Interpolation of Discharge Data at Station 2005

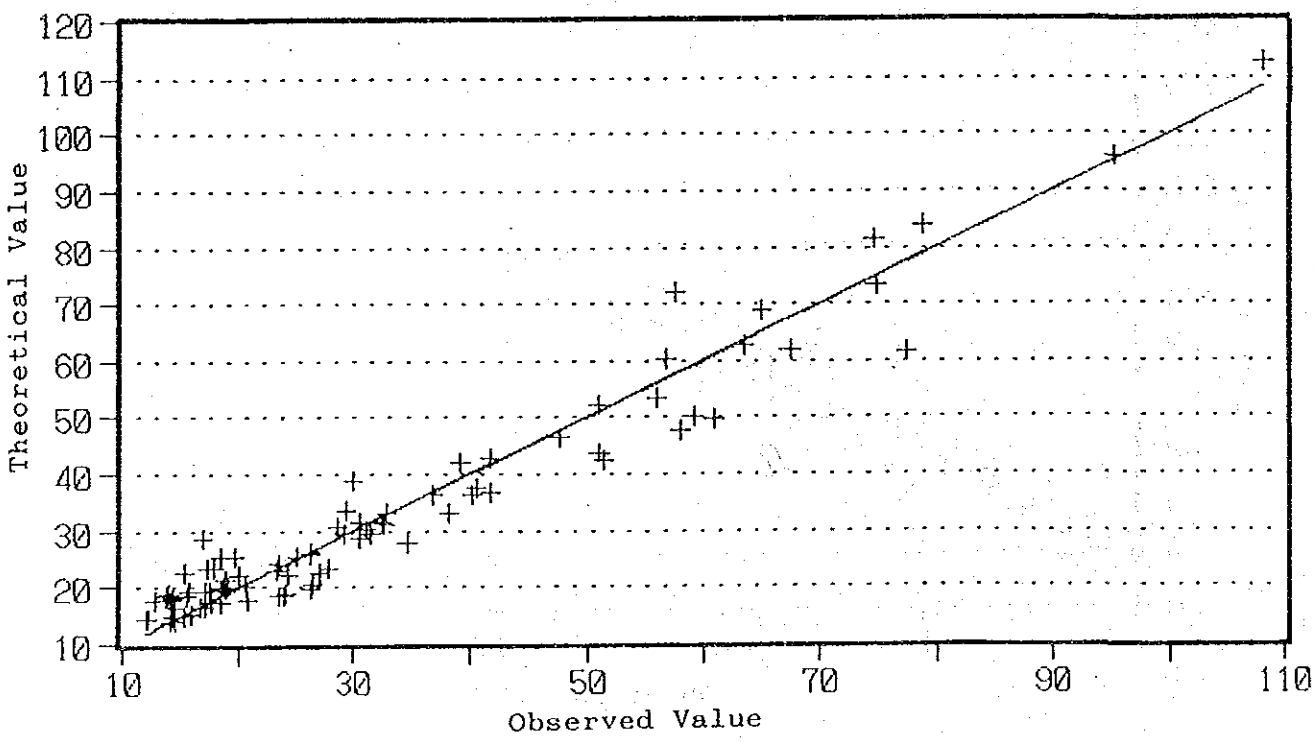
		Coefficient	T-Value	Power	Standard Deviation	95% Confidence Interval
	a0	8.02271	9.48437	1%	0.84588	6.34087 - 9.70456
2007	a4	1.46095	16.2711	1%	0.08978	1.28243 - 1.63947
2022	a5	1.08414	6.25535	1%	0.17331	0.73954 - 1.42874

Standard Partial Regression Coefficient	
b4	0.72865
b5	0.28012

-Multiple Correlation Coefficient	0.97166
-Decision Coefficient	0.94412
-Decision Coefficient Regulated Free Ratio	0.94281
-Standard Deviation	4.90279
-Durbin-Watson Ratio	0.86565

$$Q_{2005} = a_0 + a_4 * Q_{2007} + a_5 * Q_{2022}$$

Relationship between Observed Value and Theoretical Value
(Multiple Correlation Coefficient R=0.9717)



(Result -4) Interpolation of Discharge Data at Station 2009

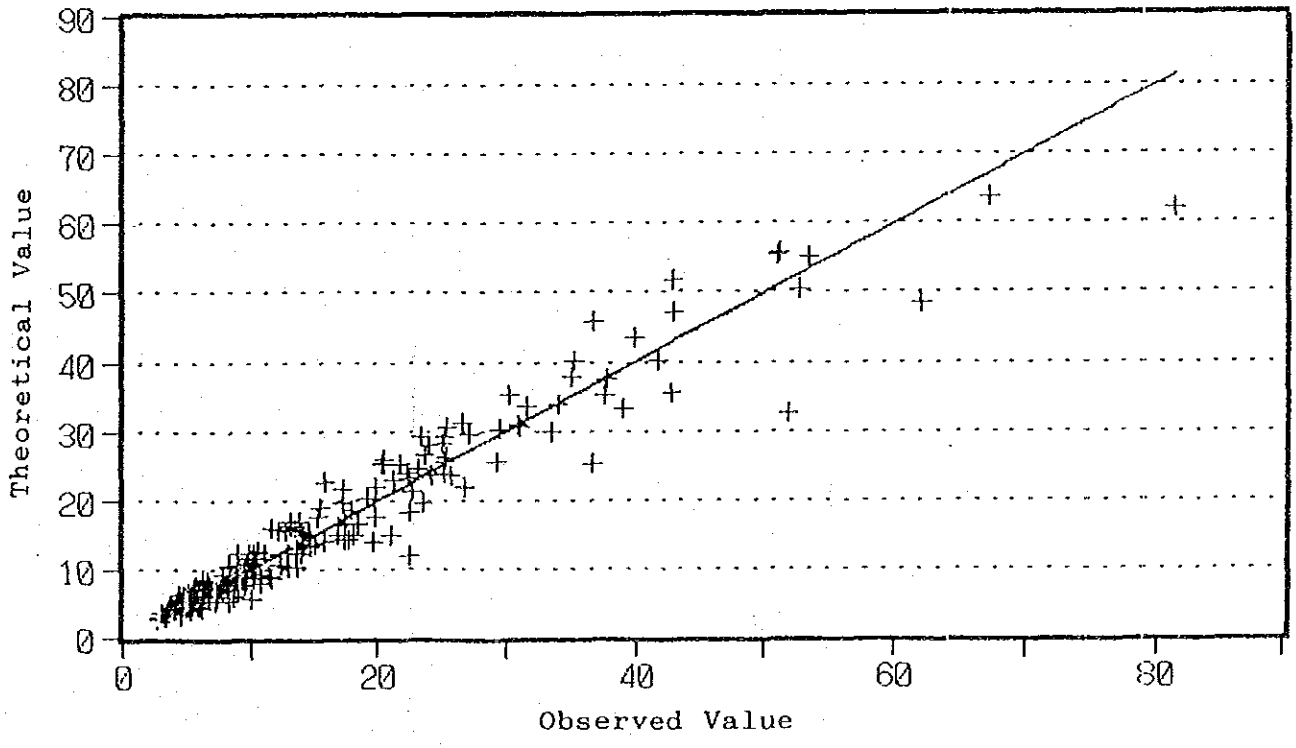
		Coefficient	T-Value	Power	Standard Deviation	95% Confidence	Interval
	a0	-0.2528	-0.6556		0.38560	-1.0132	0.50758
2006	a1	1.47249	52.8505	1%	0.02786	1.41755	1.52743

Standard Partial Regression Coefficient	
b1	0.96633

-Multiple Correlation Coefficient	0.96633
-Decision Coefficient	0.93380
-Decision Coefficient Regulated Free Ratio	0.93347
-Standard Deviation	3.48817
-Durbin-Watson Ratio	0.06019

$$Q_{2009} = a_0 + a_1 * Q_{2006}$$

Relationship between Observed Value and Theoretical Value
(Multiple Correlation Coefficient R=0.9663)



Ⅲ - 4 Discharge Estimation Method at ADATEPE Dam

As discharge observation is not sufficiently available for Adatepe dam site, estimate was made using data from upstream(2006)and downstream(2009)stations. Discharge correlation at the 2 stations is shown as below.

Discharge ratio is Q2009/ Q2006 = 1.7,and distributes proportionally. Relationship between discharge and size of catchment area is expressed as follows.

$$\frac{A_{2009}}{A_{2006}} = \alpha \frac{Q_{2009}}{Q_{2006}}$$

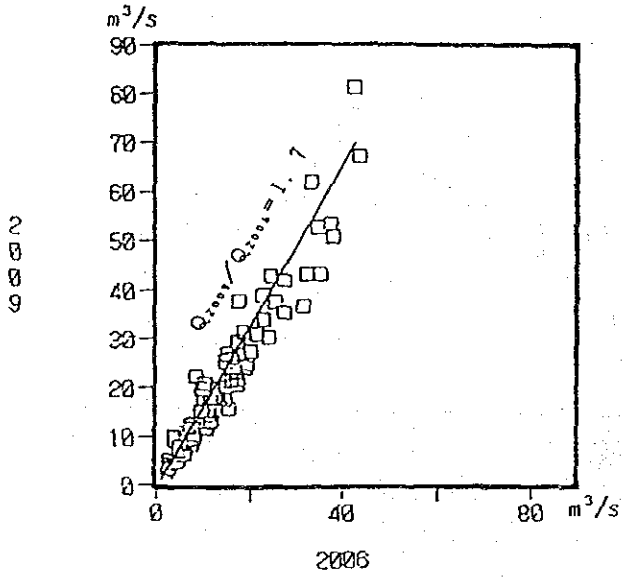
$$\alpha = \frac{1}{1.70} \times \frac{1387}{739} = 1.104$$

The relationship between discharge at Adatepe dam site and that at 2006 is expressed as follows.

$$Q_{Adatepe} = \frac{1}{\alpha} \frac{A_{Adatepe}}{A_{2006}} Q_{2006}$$

$$= \frac{1}{1.104} \times \frac{982}{739} \times Q_{2006}$$

$$= 1.200 \times Q_{2006}$$



Correlation at Observation Points 2006 and 2009

Table Ⅲ-1
Sheet 1

Monthly Average Mean Temperature (Elbistan 1964 - 1987) (Unit:℃)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1964	-7.5	-3.3	5.2	9.6	14.3	20.2	23.1	21.0	16.9	10.1	4.2	0.8	9.6
1965	-2.8	-1.9	4.7	9.4	15.1	19.7	23.1	24.0	17.3	8.3	3.7	0.0	10.1
1966	3.6	4.8	5.7	11.6	15.2	19.9	23.7	23.8	17.2	12.2	8.1	1.9	12.3
1967	-2.2	-4.5	3.0	9.0	14.9	18.0	21.0	21.8	16.6	10.9	4.2	1.3	9.5
1968	-7.0	-4.4	3.0	12.0	16.1	18.2	23.6	20.4	16.6	12.1	6.9	3.0	10.0
1969	-0.9	-1.7	6.3	8.2	15.8	20.7	21.5	22.1	17.3	12.0	3.6	2.1	10.6
1970	1.3	3.6	6.6	12.8	14.7	20.2	23.2	21.6	16.7	9.9	8.0	-0.4	11.5
1971	-0.2	0.4	5.1	8.8	16.5	18.8	23.8	22.2	18.6	8.6	4.9	-1.3	10.4
1972	-12.6	-6.4	4.2	11.7	14.2	18.5	24.1	22.7	18.1	13.1	2.7	-3.5	8.9
1973	-5.0	2.8	4.1	9.7	16.0	18.6	23.3	22.9	17.3	12.4	1.4	-1.7	10.2
1974	-7.5	-3.1	7.3	8.8	15.8	21.2	23.3	21.8	15.9	14.0	5.8	0.2	10.3
1975	-8.6	-3.1	4.0	12.2	14.1	20.0	24.1	21.7	17.5	10.4	3.6	-4.9	9.3
1976	-5.9	-10.4	2.4	9,5	14.7	19.0	20.8	21.8	16.6	11.7	6.9	1.5	9.1
1977	-7.7	2.2	3.9	11.0	15.7	19.7	22.3	22.5	18.1	8.8	6.3	-1.0	10.2
1978	0.1	4.5	6.8	10.3	15.9	18.4	24.1	21.2	17.9	12.7	1.9	2.3	11.3
1979	0.2	4.0	6.8	11.5	16.0	19.8	21.5	24.0	19.1	12.9	8.0	-1.5	12.1
1980	-6.3	-4.7	4.1	10.0	15.1	20.5	24.5	22.5	16.9	11.7	6.3	0.7	10.1
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-0.2	-2.4	2.6	11.3	14.5	19.2	21.2	21.7	18.4	11.0	3.1	-1.7	9.9
1983	-6.9	-3.2	3.7	10.2	14.5	17.7	21.8	21.3	16.3	9.9	7.6	0.9	9.5
1984	0.6	2.4	7.2	9.6	15.0	19.1	22.9	19.4	5.8	10.4	5.4	-7.6	9.2
1985	0.2	-2.7	1.4	12.7	17.4	20.4	21.6	24.2	17.6	9.8	7.7	0.3	10.9
1986	-0.3	1.3	5.7	11.8	11.9	18.9	24.8	24.5	19.5	10.9	2.4	-0.1	10.9
1987	-4.3	2.2	0.8	9.5	16.0	20.2	24.0	22.1	17.1	10.3	3.1	0.4	10.1
Average	-3.5	-1.0	4.5	10.5	15.1	19.4	22.9	22.2	16.9	11.0	5.0	-0.2	10.3

Monthly Average Maximum Temperature (Elbistan 1978 - 1987) (Unit:℃)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	3.2	10.1	12.8	16.1	23.4	26.1	33.4	30.5	27.7	22.4	10.7	6.0	18.5
1979	4.7	8.7	13.3	18.2	23.0	27.7	30.1	33.5	30.2	20.9	14.3	3.6	19.0
1980	-2.0	-0.1	9.1	15.6	21.8	28.7	34.9	32.0	27.1	21.8	13.8	6.4	17.4
1981	5.0	6.8	12.4	16.2	19.0	27.2	32.2	31.7	-	-	-	9.4	-
1982	6.4	3.8	8.5	17.1	21.6	27.4	29.9	31.4	28.7	20.5	11.0	6.0	17.7
1983	-1.9	1.5	9.3	16.7	21.0	25.1	30.0	30.3	26.8	18.6	12.3	6.7	16.4
1984	5.2	8.4	12.2	15.3	21.7	27.1	31.5	27.9	28.9	21.9	10.7	-1.9	17.4
1985	3.9	1.9	7.9	19.2	24.1	28.0	31.1	34.2	27.7	17.4	14.8	5.2	18.0
1986	3.7	6.0	12.5	19.6	18.0	26.0	33.6	34.2	29.4	18.8	9.1	6.5	18.1
1987	-0.6	7.2	5.5	15.1	23.0	27.5	32.4	30.7	28.6	18.4	10.1	4.4	16.9
Average	2.8	5.4	10.4	16.9	21.7	27.1	31.9	31.6	28.3	20.1	11.9	5.2	17.8

Monthly Average Minimum Temperature (Elbistan 1978 - 1987) (Unit:℃)

year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	-2.7	-0.3	0.9	3.9	6.1	7.6	11.2	10.4	7.4	4.3	-4.8	-1.1	3.6
1979	-4.1	0.2	0.4	3.7	7.7	9.8	10.3	12.6	7.4	5.7	2.7	-6.0	4.2
1980	-10.5	-9.1	-0.6	4.2	6.8	9.1	13.2	10.7	5.7	3.1	0.3	-3.6	2.4
1981	-1.7	-1.8	1.8	1.6	4.8	9.4	11.7	11.2	-	-	-	1.3	-
1982	-5.5	-7.6	-3.7	5.4	6.9	8.5	10.5	9.4	7.6	1.8	-2.7	-7.6	1.9
1983	-11.6	-7.4	-1.9	3.2	7.4	8.2	11.0	10.4	4.3	1.9	3.6	-3.5	2.1
1984	-2.8	-3.4	2.0	3.7	6.4	8.1	12.0	8.5	6.5	0.3	0.8	-13.2	2.4
1985	-3.4	-6.6	-5.4	5.1	9.2	10.5	10.3	12.5	6.3	3.2	1.5	-3.8	3.3
1986	-4.1	-3.5	-2.1	3.1	6.1	9.7	12.5	12.3	9.0	4.2	-2.1	-5.6	3.3
1987	-3.2	-2.2	-4.4	3.0	5.7	10.4	12.7	11.4	5.1	2.5	-2.1	-3.4	3.0
Average	-5.0	-4.2	-1.3	3.7	6.7	9.1	11.5	10.9	6.6	3.0	-0.3	-4.7	3.0

Humidity (Elbistan 1963 - 1987) (Unit:%)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1963	-	-	69	69	74	65	55	47	60	72	-	-	-
1964	-	83	78	56	60	54	48	41	55	55	70	91	-
1965	81	84	80	70	59	57	50	47	51	72	77	85	67.8
1966	83	78	68	67	56	46	42	45	53	63	81	85	63.9
1967	81	78	79	67	66	54	50	50	54	72	79	82	67.7
1968	80	80	71	61	67	56	45	50	59	67	79	82	66.4
1969	82	82	75	66	63	52	46	47	53	65	70	80	65.1
1970	77	74	69	52	53	46	46	44	50	66	72	77	60.5
1971	74	73	67	69	55	49	44	50	48	67	68	76	61.7
1972	79	77	64	61	60	57	44	48	52	61	72	68	61.9
1973	73	69	62	57	50	47	42	45	49	58	69	75	58.0
1974	77	76	64	60	49	40	40	48	50	53	72	74	58.6
1975	80	78	63	55	60	48	43	44	49	55	58	68	58.4
1976	68	68	68	64	62	54	52	50	57	68	70	75	63.0
1977	73	75	75	60	60	50	48	50	55	59	64	78	62.3
1978	50	67	64	59	49	45	43	48	52	58	61	80	56.3
1979	74	73	62	53	57	52	44	47	48	63	71	81	60.4
1980	81	80	69	62	53	43	-	47	52	60	70	76	-
1981	75	75	66	64	60	52	47	49	-	-	-	-	-
1982	69	65	59	62	57	47	44	46	49	57	61	65	56.8
1983	67	73	67	62	63	54	50	52	50	63	67	69	61.4
1984	70	59	64	63	55	53	47	45	47	54	69	62	57.3
1985	74	63	62	56	53	49	48	44	47	64	73	71	58.7
1986	73	74	57	56	70	56	47	46	52	70	72	67	61.7
1987	79	70	67	58	57	56	47	48	46	58	70	68	60.3
Average	74.8	73.9	67.6	61.2	58.7	51.3	46.3	47.1	51.6	62.5	70.2	75.4	61.7

Wind Velocity (Elbistan 1967 - 1987)

(Unit:m/sec)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1967	2.0	1.7	1.8	2.5	2.2	2.4	2.2	1.9	1.4	1.2	1.4	1.8	1.9
1968					1.7	2.1	1.9	2.0	1.8	1.4	1.6	1.4	-
1969	1.5	1.6	2.1	3.1	1.9	2.1	1.9	1.6	1.3	1.5	1.2	1.6	1.8
1970	1.7	2.3	2.1	2.1	2.6	2.1	1.9	2.0	1.7	1.5	1.4	1.3	1.9
1971	1.0	2.1	2.6	2.0	1.9	2.0	2.0	1.7	1.5	1.1	1.6	1.5	1.8
1972	0.9	1.3	1.8	2.4	2.0	1.8	2.0	1.7	1.4	1.7	1.3	1.2	1.6
1973	1.2	2.1	2.2	2.4	2.2	2.1	2.1	1.7	1.4	1.4	1.5	1.5	1.8
1974	1.1	1.1	1.9	2.3	2.0	2.0	2.1	1.7	1.5	1.4	1.2	1.8	1.7
1975	1.1	1.4	1.9	2.2	1.6	2.0	1.8	1.5	1.6	1.2	1.5	1.4	1.6
1976	1.4	1.2	1.3	1.9	1.8	1.3	1.5	1.4	1.2	1.2	1.2	1.4	1.4
1977	1.4	1.5	1.8	2.3	1.8	1.7	1.6	1.4	1.3	1.0	1.3	1.1	1.5
1978	1.4	1.9	2.3	2.4	1.8	1.7	1.7	1.6	1.5	1.1	1.1	1.2	1.6
1979	1.6	1.7	1.6	2.0	1.6	1.4	1.8	1.4	1.3	1.2	1.4	1.0	1.5
1980	1.4	0.8	1.8	2.3	1.5	1.4	-	1.3	1.2	0.9	-	1.3	-
1981	2.3	1.8	1.9	1.7	1.6	1.5	1.2	1.2	-	-	-	2.1	-
1982	1.2	1.4	2.0	2.3	1.7	1.6	1.7	1.4	1.2	1.3	1.2	1.0	1.5
1983	1.7	1.6	1.8	1.9	1.5	1.5	1.5	1.5	1.1	1.0	1.4	1.1	1.5
1984	1.4	1.4	2.1	2.1	1.9	1.5	1.8	1.4	1.2	1.1	1.2	1.1	1.5
1985	1.2	2.3	1.4	2.2	1.7	1.5	1.6	1.4	1.1	1.3	1.0	1.1	1.5
1986	1.3	1.6	1.5	1.6	1.5	1.7	1.4	1.3	1.3	0.9	0.9	1.6	1.4
1987	1.4	1.6	2.0	2.5	1.9	2.0	1.5	1.5	1.0	1.3	1.2	1.5	1.6
Average	1.4	1.6	1.9	2.2	1.8	1.8	1.8	1.6	1.4	1.2	1.3	1.4	1.6

Table Ⅲ- 1
Sheet 5

Sunshine Duration (Elbistan 1983 - 1987) (Unit:hr)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1983	3.0	2.2	5.1	5.9	7.7	10.0	11.6	11.3	9.9	6.7	2.9	3.7	6.7
1984	2.4	5.0	1.5	7.2	9.2	10.5	11.4	11.1	10.4	8.4	3.7	2.7	7.0
1985	2.3	4.2	6.0	7.6	8.2	11.0	11.7	10.8	10.3	6.6	4.7	3.5	7.2
1986	2.8	3.0	6.8	8.1	5.9	9.9	12.0	11.2	9.6	6.6	4.3	3.8	7.0
1987	1.2	4.4	5.0	6.8	9.4	11.1	11.5	10.9	10.6	6.0	4.0	2.1	6.9
Average	2.3	3.8	4.9	7.1	8.1	10.5	11.6	11.1	10.2	6.9	3.9	3.2	7.0

Evapolation (Adatepe 1980 - 1987) (Unit:mm)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1980	0.0	0.0	0.0	0.0	0.0	270.7	323.6	282.7	212.3	119.9	0.0	0.0	1209.2
1981	0.0	0.0	0.0	144.6	146.0	226.4	291.2	277.3	202.4	123.7	0.0	0.0	1411.6
1982	0.0	0.0	0.0	103.2	159.9	223.0	251.5	247.4	162.9	112.8	0.0	0.0	1260.7
1983	0.0	0.0	0.0	0.0	151.0	210.8	288.9	244.0	186.7	95.3	0.0	0.0	1176.7
1984	0.0	0.0	0.0	109.1	186.0	246.9	292.4	236.4	186.0	112.5	0.0	0.0	1369.3
1985	0.0	0.0	0.0	145.3	165.8	219.7	287.4	257.9	197.3	91.7	48.1	0.0	1413.2
1986	0.0	0.0	0.0	145.1	109.7	195.2	185.0	154.8	178.1	90.7	0.0	0.0	1058.6
1987	0.0	0.0	0.0	0.0	185.6	231.9	329.6	307.6	232.6	0.0	0.0	0.0	1287.3
Average	0.0	0.0	0.0	80.9	138.0	228.1	281.2	251.0	194.8	93.3	6.0	0.0	1273.3

Table III-2
Sheet 1

Monthly Precipitation (Elbistan, 1955 - 1984) (Unit:mm)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1955	8.3	31.9	58.1	64.8	42.4	5.3	0.0	0.0	0.0	0.0	54.8	56.2	321.8
1956	23.3	56.5	36.4	33.4	6.3	0.0	0.0	2.1	5.4	31.5	26.2	53.0	274.1
1957	13.7	33.1	64.6	65.1	-	46.3	18.0	0.0	0.0	7.5	21.1	22.1	-
1958	69.2	24.0	79.0	37.4	61.8	19.4	0.0	0.0	0.0	26.0	6.2	38.1	361.1
1959	47.1	46.6	34.1	49.5	18.6	37.4	1.0	0.5	8.7	43.2	19.7	15.2	321.6
1960	85.0	71.8	64.9	86.2	64.8	9.9	1.9	0.0	12.2	20.0	84.6	24.4	525.7
1961	72.0	15.1	94.0	2.7	29.3	2.8	0.0	0.0	17.4	17.6	63.4	49.2	363.5
1962	0.0	84.9	15.9	21.6	41.6	0.0	0.0	3.1	0.0	9.1	11.5	78.4	266.1
1963	64.7	63.2	18.4	109.4	68.7	17.7	3.0	0.0	26.5	42.2	13.9	18.5	446.2
1964	9.1	44.7	82.7	1.8	40.1	14.7	0.0	0.0	0.3	0.0	42.1	61.1	296.6
1965	31.4	58.5	101.5	42.4	6.9	21.6	0.0	0.0	12.9	36.0	71.9	99.4	482.5
1966	96.3	20.5	35.7	42.3	12.9	12.1	0.0	0.4	10.5	23.2	70.4	107.3	431.6
1967	47.6	31.3	67.6	44.0	75.1	17.1	21.0	0.0	11.6	73.0	86.8	69.7	544.8
1968	131.3	14.7	57.5	38.8	64.9	35.9	0.1	2.4	26.4	24.5	126.3	41.6	564.4
1969	77.5	53.3	85.1	61.3	125.6	16.8	0.0	0.7	7.4	28.0	24.0	52.1	531.8
1970	20.9	56.8	76.7	2.7	30.0	4.0	6.1	0.4	5.5	75.8	69.2	25.6	373.7
1971	13.0	32.8	54.3	72.6	18.3	13.9	0.0	23.1	2.6	33.4	12.8	38.9	315.7
1972	29.2	6.5	18.5	84.2	76.8	41.8	3.4	33.9	15.4	45.4	39.8	1.6	396.5
1973	21.6	34.2	36.4	61.8	28.7	23.8	2.3	1.0	1.6	26.2	51.1	14.8	303.5
1974	26.0	9.6	55.9	67.1	14.0	10.8	0.0	9.7	30.2	24.2	20.5	71.8	339.8
1975	34.2	48.6	19.3	83.0	68.9	10.0	0.0	0.0	0.0	2.1	13.7	20.9	300.7
1976	69.9	45.7	50.1	117.4	70.3	27.9	9.0	0.0	15.0	96.2	8.5	38.5	548.5
1977	30.1	34.4	125.6	78.4	18.3	3.8	0.4	1.8	16.3	16.6	8.1	59.9	393.7
1978	93.8	27.4	63.0	71.1	31.5	14.6	0.0	0.0	13.8	61.0	0.0	59.9	436.1
1979	96.6	64.0	18.2	36.2	58.4	29.9	6.0	3.8	1.9	43.4	92.7	43.0	494.1
1980	53.5	21.7	75.3	90.7	56.3	0.5	0.0	6.1	0.0	17.4	33.8	51.0	406.3
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	23.4	16.0	53.7	69.9	56.8	3.0	7.0	2.4	9.5	18.7	21.5	44.8	326.7
1983	11.2	30.2	53.1	51.5	83.3	17.7	0.0	0.0	3.8	33.5	60.5	22.3	367.1
1984	33.8	15.9	40.2	62.6	13.6	8.9	0.3	0.1	0.0	5.0	32.4	34.7	247.5
Average	46.0	37.7	56.4	56.9	45.9	16.1	2.7	3.2	8.8	30.4	40.9	45.3	390.3

Table III - 2
Sheet 2

Discharge Data **** CEYHAN, No.2005 ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	26.58	25.88	32.40	39.47	35.43	21.38	17.23	16.50	16.90	14.64	14.73	16.67
1956	16.37	21.84	24.34	48.44	35.52	21.45	15.66	13.60	14.40	14.76	14.89	15.16
1957	14.41	16.19	34.33	24.74	32.30	25.51	13.51	11.89	12.57	13.85	14.39	17.81
1958	17.64	18.64	3.43	46.00	27.56	23.79	13.14	12.10	13.47	15.35	15.33	16.55
1959	16.43	15.13	21.13	28.37	19.10	15.26	11.51	11.32	11.92	13.34	13.22	13.44
1960	16.01	16.82	27.31	58.05	34.95	19.04	14.32	12.76	13.63	12.40	13.10	13.60
1961	14.60	15.60	18.00	36.00	20.30	11.30	8.99	8.52	9.45	12.61	12.74	15.50
1962	13.90	15.88	41.46	35.90	26.79	16.36	13.70	13.53	13.02	13.24	12.73	16.36
1963	20.61	28.71	31.72	52.15	54.75	36.60	16.72	15.75	15.58	17.71	17.56	16.63
1964	14.97	15.08	33.42	33.13	20.34	16.95	12.55	12.12	11.96	12.46	13.24	16.00
1965	15.05	15.52	49.16	69.27	45.31	24.83	15.08	12.69	14.89	17.22	17.83	22.30
1966	48.07	44.25	53.92	63.51	41.71	25.93	17.63	14.43	17.82	19.08	27.67	35.58
1967	32.48	27.86	36.38	70.01	64.96	30.71	24.10	20.22	20.17	22.58	36.38	31.35
1968	32.18	34.17	66.18	99.52	74.43	36.99	22.78	21.37	20.96	22.45	39.60	46.42
1969	42.01	42.75	88.30	98.75	114.30	59.19	39.66	32.88	33.22	35.50	33.50	36.70
1970	35.30	37.50	57.90	57.40	38.20	28.00	24.10	21.54	19.56	23.98	24.64	29.42
1971	26.05	24.57	34.38	63.94	44.72	26.09	20.50	21.95	20.58	19.47	20.11	21.63
1972	19.93	18.83	23.77	35.30	36.38	30.45	18.84	16.89	16.04	17.65	18.37	16.65
1973	15.91	17.09	20.57	30.66	17.85	13.27	11.61	11.34	9.88	10.64	11.22	11.97
1974	10.68	11.45	33.03	36.37	15.39	13.14	11.76	12.41	12.98	10.74	11.36	12.03
1975	12.02	12.12	31.20	74.68	56.93	21.30	18.09	16.82	16.18	14.77	16.84	16.15
1976	14.45	14.11	24.30	74.85	63.73	36.99	20.04	18.10	17.36	20.04	23.41	25.09
1977	18.84	32.95	59.27	78.83	65.15	29.41	18.62	15.14	14.05	18.72	17.03	17.48
1978	18.97	30.61	51.47	77.42	61.16	32.61	15.85	16.22	16.79	18.87	26.33	26.52
1979	40.16	41.88	51.13	58.22	40.59	38.38	15.99	12.68	14.66	15.52	28.66	26.35
1980	27.92	27.19	57.70	108.30	95.30	47.68	31.54	22.08	21.40	23.24	21.59	23.81
1981	23.51	28.23	68.91	66.83	66.67	44.66	26.89	20.13	19.47	20.38	21.23	25.60
1982	25.47	20.95	25.70	67.13	50.58	31.79	22.10	19.54	19.40	18.48	24.17	24.03
1983	23.64	20.85	34.67	67.47	51.06	30.71	20.12	18.44	12.97	15.77	29.24	32.73
1984	23.50	26.22	41.90	56.17	39.18	19.10	11.71	10.57	10.05	12.83	14.35	13.65

Table III- 2
Sheet 3

Discharge Data **** GOKSUN, No.2006 ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	8.51	8.97	12.22	17.43	16.51	8.64	4.73	3.97	3.22	3.14	3.41	3.42
1956	3.42	7.06	9.77	22.90	21.40	11.65	5.93	4.06	3.66	3.43	3.30	3.16
1957	3.08	3.18	12.55	10.27	11.41	8.50	3.45	2.27	2.14	2.24	2.48	4.25
1958	6.08	7.12	16.49	25.88	20.00	12.17	5.82	3.72	3.14	3.09	2.99	3.20
1959	3.23	3.29	9.71	16.06	12.96	7.21	3.43	2.63	2.31	2.55	2.45	2.15
1960	3.80	4.94	9.83	20.38	18.17	8.00	4.37	2.92	2.56	3.26	3.12	2.96
1961	3.22	4.33	6.36	14.00	11.10	4.95	3.15	2.37	2.30	2.05	2.18	3.76
1962	3.40	5.49	20.64	19.97	17.28	8.47	4.35	3.05	2.68	2.74	2.63	6.08
1963	10.31	13.46	14.59	17.26	29.82	20.81	9.97	5.88	5.32	5.34	4.52	3.83
1964	2.96	2.88	11.01	11.55	8.73	5.90	2.47	1.72	1.71	2.07	2.45	4.18
1965	3.61	4.02	20.30	26.91	23.16	12.44	5.75	3.88	3.56	3.79	3.65	5.31
1966	18.15	14.44	19.87	29.38	24.80	13.45	7.30	4.90	4.55	4.95	8.14	13.23
1967	11.87	8.40	13.68	26.74	28.48	13.69	8.09	5.57	4.70	4.98	6.54	6.15
1968	7.34	8.36	26.33	44.38	30.53	14.95	8.20	5.99	5.86	5.55	9.42	11.49
1969	10.51	9.29	32.88	33.60	47.59	19.89	10.46	7.70	6.50	5.99	5.28	6.96
1970	7.26	10.90	20.10	24.70	16.10	9.41	6.12	4.04	3.54	4.89	5.28	6.24
1971	4.62	4.60	10.20	23.28	19.88	10.21	4.94	4.67	3.68	3.48	3.42	3.04
1972	2.65	2.51	5.59	13.83	14.72	7.59	3.43	2.34	2.44	3.34	3.10	2.46
1973	2.25	2.67	5.63	12.51	10.55	5.08	2.70	1.74	1.83	2.22	2.23	2.34
1974	1.85	2.51	12.93	12.21	9.76	4.02	2.34	2.22	2.36	2.87	2.59	3.12
1975	2.87	3.36	16.17	38.06	27.52	11.66	5.57	4.03	3.46	3.46	3.61	3.65
1976	3.88	3.22	11.50	37.50	31.40	15.40	7.22	4.68	4.50	7.62	6.02	9.47
1977	6.37	19.21	22.74	37.87	35.45	14.91	7.44	4.72	4.54	5.12	4.38	4.31
1978	5.56	11.28	16.91	25.62	24.13	13.59	6.15	4.36	3.78	5.58	5.14	7.08
1979	17.45	15.14	16.24	20.18	17.73	10.73	4.30	2.83	3.18	3.49	6.12	7.37
1980	6.11	6.08	22.26	42.36	43.50	19.39	8.46	5.30	5.77	7.49	4.88	5.98
1981	6.53	10.28	33.15	27.48	23.15	15.79	8.31	5.89	5.57	5.18	5.32	9.18
1982	10.45	6.61	8.88	24.08	20.82	10.77	5.93	3.34	3.51	4.11	3.79	3.55
1983	2.79	3.28	8.38	24.23	21.06	10.74	4.29	3.63	4.03	3.71	7.97	7.16
1984	5.87	7.57	12.79	17.96	17.38	9.06	4.35	3.25	3.09	2.84	3.30	3.21

Table III - 2
Sheet 4

Discharge Data **** HURMAN, No.2007 ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1957	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1962	3.25	3.87	13.90	16.00	12.70	8.16	6.00	5.36	4.68	4.15	3.76	4.61
1963	6.69	10.43	12.34	23.80	24.94	21.17	11.07	8.32	7.51	7.32	6.70	5.86
1964	5.36	5.09	11.73	15.30	10.49	7.28	4.71	4.14	3.73	6.64	9.10	11.69
1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1967	11.98	9.93	11.67	28.03	29.39	14.58	9.83	7.91	7.27	8.93	11.22	10.22
1968	11.02	11.52	26.90	49.93	32.26	19.33	11.05	9.26	8.48	9.48	13.20	12.35
1969	12.71	13.04	32.77	41.20	45.94	26.40	17.32	12.81	13.05	12.73	10.82	11.48
1970	11.53	12.05	20.52	26.30	16.61	12.92	9.87	8.29	7.38	7.47	7.51	7.77
1971	6.87	6.57	9.70	20.22	17.21	10.73	7.84	7.98	6.47	6.17	5.94	5.90
1972	5.30	4.87	6.87	11.96	14.68	12.30	7.41	6.13	5.46	5.92	5.75	5.33
1973	4.54	4.53	5.47	8.82	7.47	5.03	3.68	3.17	2.78	2.82	2.84	3.10
1974	2.87	3.89	9.06	13.31	8.39	6.12	4.53	4.17	4.18	3.84	3.28	3.30
1975	3.09	3.06	10.49	30.10	28.65	11.99	8.67	7.13	6.12	5.50	4.83	4.10
1976	3.73	3.49	6.82	30.00	26.90	15.14	9.27	7.65	6.97	8.13	8.16	8.36
1977	7.16	12.21	20.82	38.93	33.55	15.70	10.07	7.99	7.43	7.94	7.18	6.99
1978	7.20	10.74	16.74	27.00	20.68	13.54	9.25	7.45	6.97	7.33	7.50	7.37
1979	15.06	14.54	18.53	19.70	15.63	14.69	8.41	6.75	6.97	6.79	9.04	8.57
1980	8.28	8.06	31.28	59.30	50.39	23.55	13.74	11.67	11.01	9.79	8.67	8.76
1981	8.91	10.45	30.02	29.23	29.94	18.80	12.02	9.60	8.47	7.79	7.85	8.96
1982	9.48	7.58	8.91	28.20	21.98	13.75	8.78	7.44	7.40	7.39	7.00	6.65
1983	6.53	6.11	10.25	26.67	21.73	13.98	8.63	7.54	6.46	7.21	11.99	12.22
1984	9.69	10.24	16.55	19.92	17.68	10.67	7.25	6.11	5.83	6.43	6.50	6.44

Discharge Data **** GOKSUN, No.2009 ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	13.97	13.61	19.76	25.27	22.27	10.59	4.73	3.97	3.22	3.14	3.80	4.78
1956	5.00	13.52	17.25	31.54	26.68	13.83	6.12	4.06	3.66	4.29	4.74	3.92
1957	5.02	6.11	22.40	14.06	17.27	10.31	3.45	2.27	2.14	2.77	3.58	7.44
1958	10.32	12.84	25.22	35.06	23.33	15.16	5.82	3.72	3.14	4.31	4.21	6.09
1959	5.76	5.94	15.62	22.45	15.42	8.24	3.43	2.63	2.31	3.74	3.58	3.45
1960	8.22	8.95	17.56	33.55	23.62	9.93	4.98	2.92	3.07	3.63	4.12	3.99
1961	4.96	8.63	11.40	19.10	13.40	5.52	3.15	2.37	2.30	2.76	3.34	7.20
1962	5.48	10.68	29.46	25.25	20.43	8.97	4.35	3.05	2.68	3.75	3.52	11.57
1963	16.85	23.55	22.55	36.64	39.84	25.49	9.97	5.88	5.72	8.03	6.35	5.48
1964	4.67	4.04	23.56	16.97	10.43	6.19	2.47	1.72	1.71	2.82	4.07	6.87
1965	6.80	7.38	37.92	40.46	27.43	15.28	5.88	3.88	3.56	5.38	5.53	9.44
1966	41.49	23.52	28.91	38.58	28.08	13.86	7.30	4.90	4.65	5.37	10.06	21.14
1967	18.27	12.78	24.11	38.24	38.51	16.24	8.31	5.57	4.92	6.43	9.70	11.68
1968	14.53	15.33	48.77	60.12	39.44	17.83	8.20	5.99	5.93	6.56	14.36	19.68
1969	17.76	15.96	58.69	52.29	67.17	24.98	11.88	7.70	7.01	8.57	7.52	10.00
1970	10.43	15.79	29.34	36.11	23.45	13.60	8.76	5.66	4.96	5.84	6.90	10.02
1971	6.25	6.59	16.43	36.50	24.12	11.62	4.94	4.67	3.68	5.18	4.76	4.73
1972	5.01	6.50	8.49	16.05	19.88	10.65	4.38	3.38	3.46	5.66	6.92	3.71
1973	3.45	3.81	8.58	17.48	12.44	5.08	2.70	1.74	1.83	3.05	3.81	3.86
1974	3.80	4.07	19.41	16.96	11.00	4.32	2.34	2.22	2.36	3.80	3.42	5.07
1975	5.28	5.47	25.80	51.14	35.30	13.05	5.57	4.03	3.46	4.25	4.34	3.65
1976	5.18	5.04	18.40	53.53	36.68	15.67	7.22	4.68	4.50	9.76	8.99	15.05
1977	9.75	23.98	39.01	50.96	43.12	17.16	7.44	4.72	4.70	6.34	5.59	5.34
1978	8.00	16.83	23.17	37.69	30.24	17.11	6.15	4.36	3.78	6.20	7.54	10.12
1979	29.27	26.79	24.18	27.12	20.55	12.09	4.30	2.83	3.18	4.98	8.75	12.43
1980	9.62	9.37	51.80	81.36	67.15	25.04	11.15	6.51	5.77	8.27	7.83	9.18
1981	10.73	17.93	62.11	41.84	34.04	21.26	8.31	5.89	5.57	6.12	6.66	14.58
1982	14.45	9.29	14.08	37.67	31.13	12.73	5.93	3.34	3.51	4.84	4.81	4.21
1983	3.45	4.60	22.34	42.94	30.87	13.98	4.29	3.63	4.03	4.29	10.18	9.25
1984	6.59	10.44	17.81	25.36	20.26	9.06	4.35	3.25	3.09	3.46	4.15	4.06

Discharge Data **** HURMAN, No.2015 ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1957	3.93	3.97	8.11	7.85	8.41	7.43	5.34	4.52	4.21	3.87	3.55	3.3
1958	3.33	3.66	7.34	16.16	12.42	10.22	7.87	6.55	5.86	5.17	4.62	4.18
1959	3.84	3.48	4.57	7.9	7.5	6.25	4.67	4.05	3.78	3.53	3.26	3.11
1960	3.24	3.5	6.91	15.38	11.79	8.91	7.06	5.83	5.13	4.63	4.27	3.79
1961	3.51	3.39	3.75	7.48	7.02	5.47	4.08	3.44	3.23	2.893	2.778	3.048
1962	2.965	3.352	11.08	12.54	11.01	8.163	6.001	5.364	4.679	4.154	3.763	4.202
1963	5.771	8.488	10.12	17.88	16.2	13.9	10.29	8.324	7.507	6.638	5.989	5.35
1964	4.626	4.359	8.183	10.46	8.124	7.279	4.714	4.139	3.73	3.585	3.27	3.29
1965	2.985	2.889	12.91	24.83	17.01	12.51	9.053	7.189	6.499	5.84	5.296	5.417
1966	9.091	9.915	15.16	19.89	15.52	11.85	9.345	7.769	7.151	6.587	7.065	8.329
1967	8.047	6.951	7.797	20.7	21.02	12.97	9.826	7.908	7.268	6.801	7.084	6.503
1968	6.758	6.482	13.74	39.26	20.03	13.96	10.57	9.264	8.479	7.853	7.826	8.209
1969	8.013	7.509	25.67	36.52	38.45	21.05	15.45	12.81	11.56	10.2	9.22	8.94
1970	8.74	9.13	15.6	19.9	14.5	11.5	9.87	8.29	7.38	7.25	6.95	6.67
1971	5.7	5.41	8.32	14.68	12.4	10.29	7.84	7.98	6.47	5.606	5.296	4.788
1972	3.947	3.583	5.579	9.039	10.3	10.84	7.407	6.125	5.464	5.025	4.531	3.945
1973	3.406	3.41	3.995	5.635	6.081	5.031	3.676	3.174	2.783	2.739	2.6	2.194
1974	2.037	2.338	7.113	9.597	7.805	6.115	4.532	4.172	4.183	3.458	3.025	2.84
1975	2.906	2.913	7.251	20.88	19.6	11.99	8.671	7.131	6.118	5.502	4.834	4.067
1976	3.665	3.307	4.7	19.23	16.73	12.65	9.268	7.651	6.971	6.839	5.718	5.465
1977	5.015	7.05	12.48	25.99	20.67	14.21	10.07	7.985	7.431	7.052	6.442	5.545
1978	4.95	7.036	12.45	21.26	15.5	11.99	9.187	7.449	6.968	6.878	5.963	5.392
1979	8.625	10.33	13.81	14.81	12.65	12.9	8.22	6.745	6.966	6.135	6.693	5.726
1980	5.148	4.983	23.83	33.59	29.11	18.02	13.56	11.67	9.679	8.857	8.269	7.833
1981	6.978	7.878	21.31	20.25	19.14	15.61	12.02	9.604	8.467	7.685	6.848	8.173
1982	7.385	6.536	7.236	22.04	15.83	11.45	8.649	6.995	6.413	5.942	5.361	5.705
1983	4.828	3.949	7.12	18.65	13.86	11.36	8.629	7.539	6.462	6.29	8.378	7.972
1984	7.212	7.21	11.64	13.96	10.53	8.742	6.637	6.111	4.948	4.39	4.3	3.65

Table Ⅲ-2
Sheet 7

Discharge Data **** ADATEPE DAM SITE ****

(Unit: m^3/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1955	10.21	10.76	14.66	20.92	19.81	10.37	5.68	4.76	3.86	3.77	4.09	4.10
1956	4.10	8.47	11.72	27.48	25.68	13.98	7.12	4.87	4.39	4.12	3.96	3.79
1957	3.70	3.82	15.06	12.32	13.69	10.20	4.14	2.72	2.57	2.69	2.98	5.10
1958	7.30	8.54	19.79	31.06	24.00	14.60	6.98	4.46	3.77	3.71	3.59	3.84
1959	3.88	3.95	11.65	19.27	15.55	8.65	4.12	3.16	2.77	3.06	2.94	2.58
1960	4.56	5.93	11.80	24.46	21.80	9.60	5.24	3.50	3.07	3.91	3.74	3.55
1961	3.86	5.20	7.63	16.80	13.32	5.94	3.78	2.84	2.76	2.45	2.61	4.51
1962	4.08	6.58	24.77	23.96	20.74	10.17	5.22	3.65	3.22	3.29	3.15	7.30
1963	12.37	16.15	17.51	20.71	35.78	24.97	11.96	7.06	6.38	6.40	5.42	4.24
1964	3.55	3.45	13.21	13.86	10.47	7.08	2.97	2.06	2.05	2.49	2.94	5.02
1965	4.33	4.82	24.36	32.29	27.79	14.93	6.90	4.66	4.27	4.55	4.38	6.37
1966	21.78	17.33	23.84	35.26	29.76	16.14	8.76	5.88	5.46	5.94	9.77	15.88
1967	14.24	10.08	16.42	32.09	34.18	16.43	9.71	6.68	5.64	5.97	7.85	7.39
1968	8.81	10.04	31.60	53.26	36.64	1.00	9.84	7.19	7.03	6.66	11.30	13.79
1969	12.61	11.15	39.46	40.32	57.11	23.87	12.55	9.24	7.80	7.19	6.34	8.35
1970	8.71	13.08	24.12	29.64	19.32	11.29	7.34	4.85	4.25	5.87	6.34	7.49
1971	5.54	5.52	12.24	27.94	23.86	12.25	5.93	5.60	4.42	4.17	4.11	3.65
1972	3.18	3.01	6.71	16.60	17.66	9.10	4.11	2.81	2.92	4.01	3.72	2.95
1973	2.70	3.21	6.76	15.01	12.66	6.10	3.23	2.09	2.20	2.66	2.67	2.81
1974	2.21	3.02	15.52	14.65	11.71	4.82	2.81	2.67	2.83	3.45	3.11	3.74
1975	3.45	4.03	19.40	45.67	33.02	13.99	6.69	4.83	4.15	4.15	4.33	4.38
1976	4.66	3.86	13.80	45.00	37.68	18.48	8.66	5.62	5.40	9.14	7.22	11.36
1977	7.65	23.05	27.29	45.44	42.54	17.89	8.92	5.67	5.44	6.14	5.25	5.17
1978	6.67	13.54	20.29	30.74	28.96	16.31	7.38	5.24	4.54	6.69	6.16	8.50
1979	20.94	18.17	19.49	24.22	21.28	12.88	5.16	3.39	3.81	4.19	7.34	8.84
1980	7.33	7.30	26.71	50.83	52.20	23.27	10.15	6.36	6.93	8.98	5.85	7.18
1981	7.83	12.34	39.78	32.98	27.78	18.95	9.97	7.06	6.68	6.22	6.38	11.02
1982	12.54	7.94	10.90	28.9	24.98	12.92	7.11	4.00	4.21	4.93	4.54	4.26
1983	3.35	3.94	10.05	29.08	25.27	12.89	5.15	4.36	4.83	4.45	9.57	8.59
1984	7.04	9.08	15.35	17.95	20.86	10.88	5.22	3.90	3.71	3.41	3.96	3.85

Monthly and Yearly Average Discharge from Springs

Spring	Y \ M	1	2	3	4	5	6	7	8	9	10	11	12	Remarks
		Monthly and Yearly Average Discharge from Springs (ℓ/S)												
① PINARBASI	1983	—	9,898	10,287	8,850	13,106	10,118	—	10,280	—	—	9,804	11,174	Elevation:1,149m
	1984	11,364	9,771	9,673	8,607	10,594	9,671	—	10,827	8,361	7,272	9,146	8,112	
	1985	—	—	8,153	8,742	7,828	7,303	6,584	6,913	6,852	6,071	6,347	6,715	
	1986	6,151	5,644	7,203	7,405	6,099	5,694	5,552	5,548	5,173	5,158	5,318	—	
	1987	5,621	7,843	10,148	8,905	9,821	8,278	7,853	7,652	6,563	7,113	6,914	7,508	
	1988	7,083	7,618	8,407	—	8,812	8,714	8,569	9,127	7,863	8,441	5,984	—	
	平均 (ℓ/s)	7,555	8,155	8,979	8,502	9,377	8,296	7,140	8,391	6,962	6,811	7,252	8,377	
② KAYAPINAR	1985	—	—	54	141	135	88	53	136	92	106	48	60	Elevation:1,374m
	1986	37	35	72	138	114	129	114	103	79	60	63	—	
	1987	84	146	134	293	442	261	198	178	208	136	119	146	
	1988	179	205	260	—	598	515	489	490	194	279	352	—	
	平均 (ℓ/s)	89	129	130	191	322	248	214	227	143	145	146	103	
③ IZGIN	1985	—	—	—	—	—	—	—	—	—	652	652	828	Elevation:1,122m
	1986	806	1,546	1,346	1,520	1,473	1,487	1,293	—	1,198	679	1,154	—	
	1987	1,214	1,522	2,336	3,084	—	—	1,846	1,783	1,791	1,900	1,950	2,030	
	1988	1,827	1,961	2,794	—	3,202	3,022	2,059	2,687	2,282	2,551	—	—	
	平均 (ℓ/s)	1,282	1,676	2,159	2,302	2,338	2,255	1,733	2,235	1,757	1,446	1,252	1,429	
④ AKÇIR	1984	—	784	771	733	729	—	—	571	660	569	564	709	Elevation:1,119m
	1985	—	679	—	634	637	587	642	680	671	686	687	541	
	1986	562	798	732	611	527	530	594	592	668	679	685	—	
	1987	706	822	770	740	716	723	692	764	663	657	645	727	
	1988	695	615	776	—	768	886	800	874	618	722	933	—	
	平均 (ℓ/s)	654	740	762	680	675	682	682	696	656	663	703	—	
⑤ ÇOBANPINARI	1985	—	—	123	163	130	160	97	72	57	52	205	69	Elevation:1,241m
	1986	77	83	197	167	103	168	97	39	126	58	76	—	
	1987	147	218	231	271	264	251	186	149	132	140	152	159	
	1988	162	172	234	—	187	158	192	130	88	145	—	—	
	平均 (ℓ/s)	129	158	196	200	171	184	143	98	101	99	144	114	
⑥ MAGARAGÖZÜ	1984	386	1,045	1,347	3,787	3,275	2,598	—	447	KURU	KURU	—	KURU	Elevation:1,241m
	1985	—	413	—	1,679	2,722	794	KURU	KURU	KURU	790	202	336	
	1986	14	162	210	2,031	1,262	994	172	KURU	KURU	KURU	76	—	
	1987	104	803	1,592	4,680	4,216	3,554	418	145	54	36	379	632	
	1988	507	410	1,887	—	6,378	3,200	770	320	164	257	—	—	
	平均 (ℓ/s)	253	423	1,259	3,044	3,511	2,228	389	265	109	361	219	484	
⑦ HUNU	1985	—	—	21	57	143	80	16	8	7	22	10	9	Elevation:1,348m
	1986	6	7	6	102	248	67	29	8	7	9	10	—	
	1987	14	43	50	87	91	13	70	32	15	8	10	14	
	1988	25	32	55	—	104	122	62	16	25	24	—	—	
	平均 (ℓ/s)	15	27	33	82	147	71	44	16	14	16	10	12	
⑧ TÜDEYİN	1984	—	360	248	308	838	326	—	43	69	72	127	125	Elevation:1,160m
	1985	—	231	—	279	322	353	216	—	63	96	148	150	
	1986	145	250	246	409	378	345	289	242	161	139	165	—	
	1987	271	321	296	356	316	158	136	122	205	189	216	251	
	1988	307	345	366	—	363	240	303	91	168	258	—	—	
	平均 (ℓ/s)	241	301	289	—	443	284	236	125	133	151	164	175	
⑨ TANIR	1984	—	734	1,162	—	1,905	1,489	—	841	619	927	1,422	—	Elevation: 1,210m~1,220m
	1985	—	—	914	2,542	726	907	1,060	324	712	1,005	618	657	
	1986	580	691	1,640	1,384	978	606	603	551	489	409	416	—	
	1987	430	1,211	1,329	—	1,600	1,493	1,341	1,416	1,378	1,277	1,217	1,078	
	1988	1,368	1,165	1,240	—	—	—	584	1,252	2,050	1,605	—	—	
	平均 (ℓ/s)	793	950	1,257	1,963	1,203	1,124	897	877	1,050	1,045	918	868	

Estimated Annual Discharge from Springs

(Unit : ℓ / S)

(Unit : m³/year)

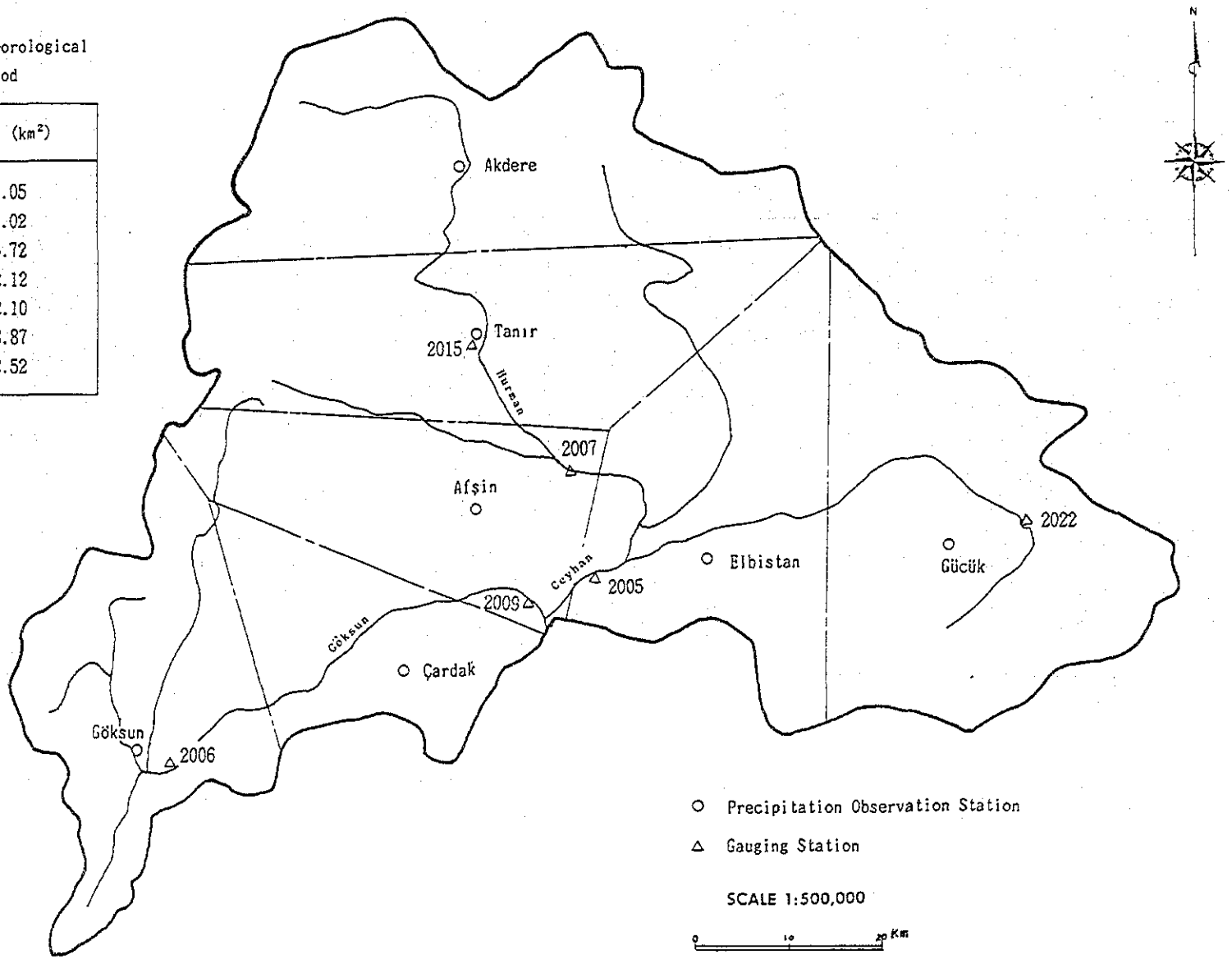
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Av. in 4 or 5 years	Annual Averagre Yield				Remark
														1984	1985	1986	1987	
1	7.555	8.155	8.979	8.502	9.377	8.296	7.140	8.391	6.962	6.811	7.252	8.377	7.983	272.05×10⁶	213.4 ×10⁶	178.09×10⁶	239.17×10⁶	
2	89	129	130	191	322	248	214	227	143	145	146	103	174		2.33×10⁶	2.82×10⁶	5.51×10⁶	
3	1.282	1.676	2.159	2.302	2.338	2.255	1.733	2.235	1.757	1.446	1.252	1.429	1.822			42.07×10⁶	61.74×10⁶	
4	654	740	762	680	675	682	682	696	656	663	703	659	688	20.9 ×10⁶	19.65×10⁶	18.72×10⁶	21.59×10⁶	
5	129	158	196	200	171	184	143	98	101	99	144	114	145		2.65×10⁶	2.77×10⁶	6.01×10⁶	
6	253	423	1.259	3.044	3.571	2.228	389	265	109	361	219	484	1.050				1984/9.10.12.dry '85/7.8.9. dry * '86/8.9.10.dry	
7	15	27	33	82	147	71	44	16	14	16	10	12	50		0.43×10⁶	0.41 ×10⁶	0.64×10⁶	
8	241	301	289	338	443	284	236	125	133	151	164	175	240	5.05×10⁶	5.89×10⁶	5.77×10⁶	7.29×10⁶	
9	793	950	1.257	1.963	1.203	1.124	897	877	1.050	1.045	918	868	1.079			18.15×10⁶	41.12×10⁶	
計	11.011	12.559	15.064	17.302	18.247	15.372	11.478	12.930	10.925	10.737	10.808	12.221	13.231					

* None Discharge

Note :
- NO. 1 PINARBASI EL. 1.149 m
- 〃 2 KAYAPINAR EL. 1.374 〃
- 〃 3 IZGIN EL. 1.122 〃
- 〃 4 AKCIR EL. 1.119 〃
- 〃 5 COBANPINAR EL. 1.241 〃
- 〃 6 MAGARA GOZU EL. 1.241 〃
- 〃 7 HUNU EL. 1.348 〃
- 〃 8 TUDEYIN EL. 1.160 〃
- 〃 9 TANIR EL. 1.210/1220 〃

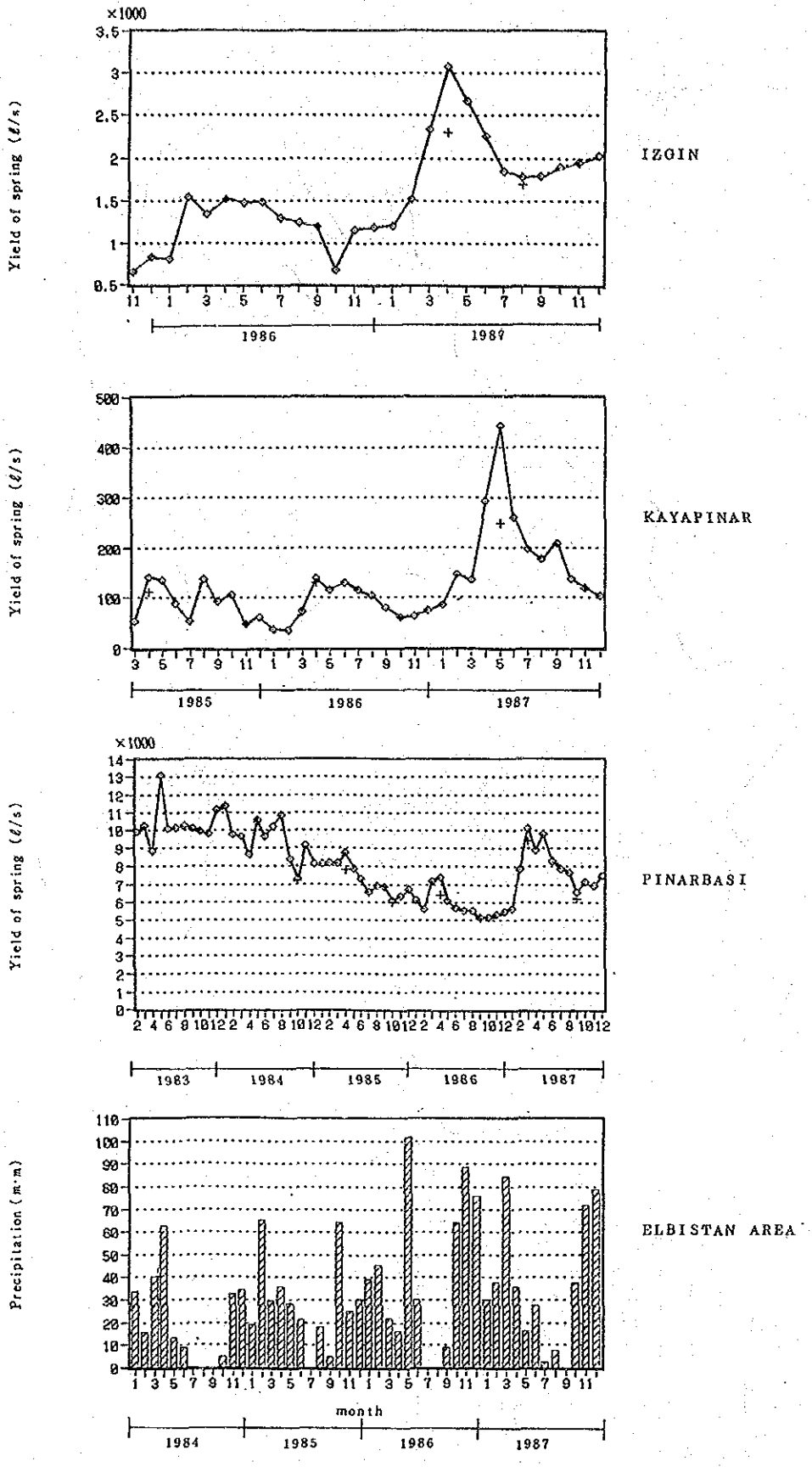
Controlled Area for Meteorological Station by Thiessen Method

Station	Area (km^2)
Göksun	748.05
Çardak	430.02
Afşin	686.72
Elbistan	832.12
Gücük	1042.10
Tanır	1068.87
Akdere	932.52



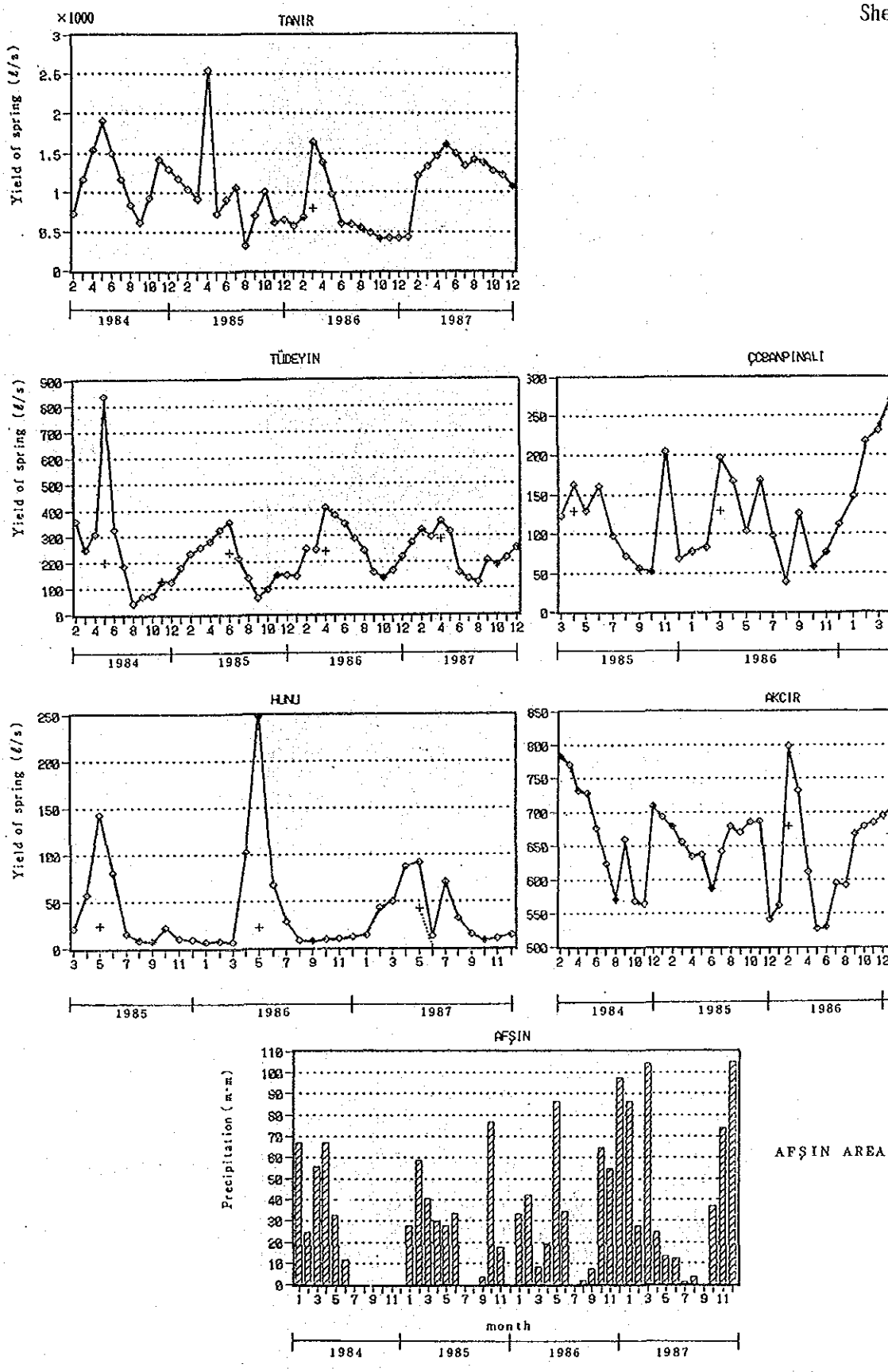
Location of Hydrological Observation Stations

Plate Ⅲ- 2
Sheet 1



Relationship Between Precipitation and Discharge from Springs

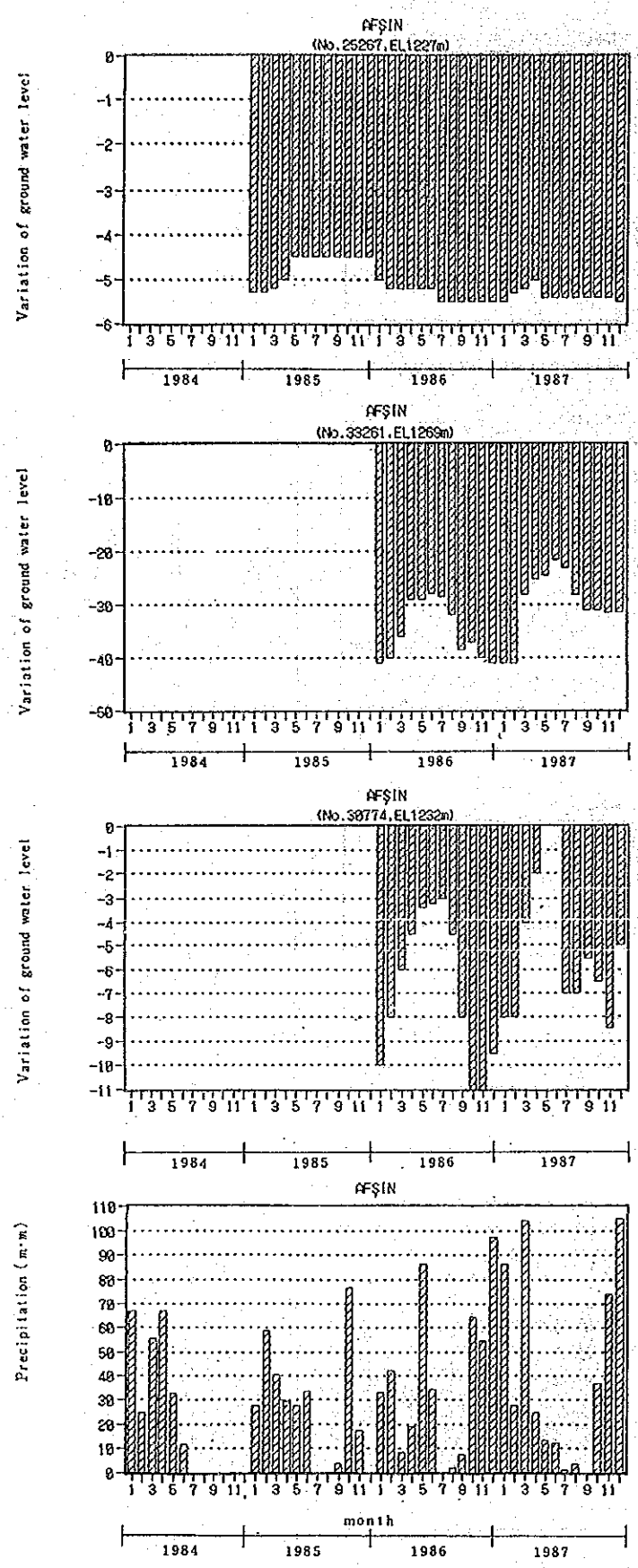
(Elbistan Area)



AFŞIN AREA

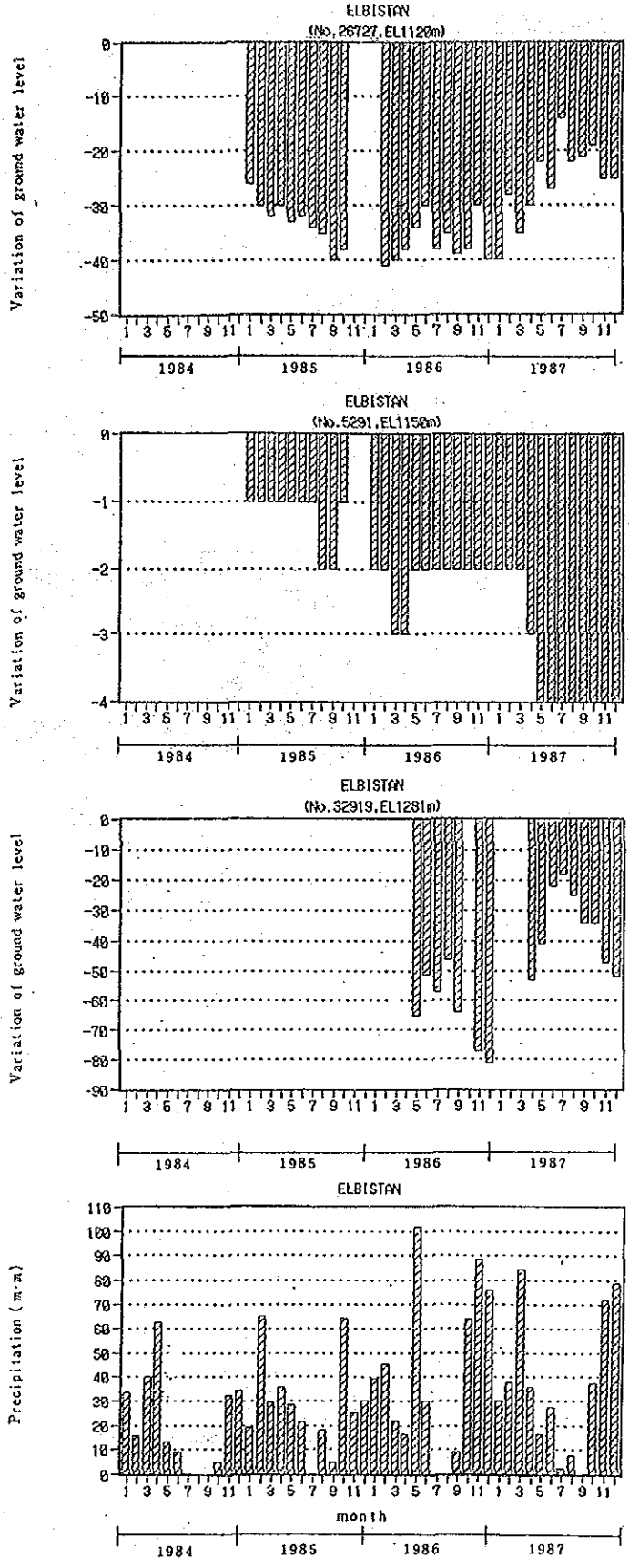
Relationship Between Precipitation and Discharge from Springs
(Afsin Area)

Plate Ⅲ- 3
Sheet 1



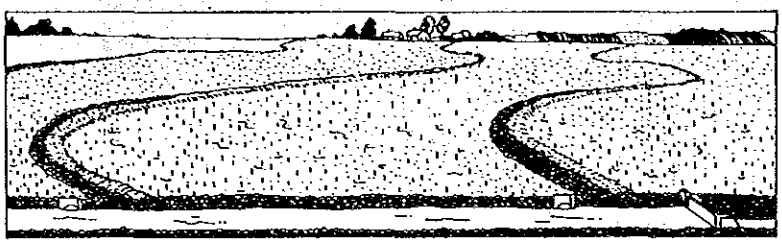
AFŞIN AREA

Relationship Between Precipitation and Ground Water Level
(Elbistan Area)



ELBISTAN AREA

Relationship Between Precipitation and Ground Water Level
(Afsin Area)



Appendix-IV

Pedology

IV-1 Explanation of Soils in the Project Area

A: Alluvial Soil (Aluvyal Topraklar)

These are primarily (A) C profile, young azonal soils formed by river sedimentation and erosive action. Consequently, soil profile shows variation due to effect of river flow.

The surface layer is discontinuous with the lower layer. Old surface layer occasionally shows leaching of limestone content. Depending on distance from the river, changes in topography and drainage conditions cause fluctuation in soil structure.

Lower layer where soil drainage is not good is generally wet. However, grayish reduction layer is rarely present.

Quantities of organic substances show large variations according to the climate, drainage and soil utilization patterns. Vegetation shows no characteristic trend due to azonal nature of soil. However, poor drainage at some locals has created areas of wet alluvial soil. Simple drainage facilities at such areas would permit growth of pasturage, etc.

K: Colluvial Soil (Koluvyal Topraklar)

These are young (A) C profile soils found at relatively flat areas at the upper reaches of rivers. In terms of characteristics, soil is similar to that found at higher elevations in the surrounding area. Profile shows variation depending on intensity of rainfall and topographical dip. In contrast to alluvial soil, profiles do not parallel topography; however, each profile is comprised of a single component. Soil found at the base and slopes of mountains contains stone rubble. Soil shows structure similar to alluvial soil in that composition is coarser in proportion to location upstream due to flow velocity. In this sense, colluvial and alluvial soil exhibit a mutual relationship at areas of gently sloping topography.

Colluvial soil is recognized where dip is at least 2%. This soil tends to be found on gently dipping, flat areas, rather than gently undulation topography.

Soil color is strongly influenced by source material and generally is not affected by drainage.

Due to topography, drainage is relatively good. As in the case of alluvial soil, this type of soil is azonal. It accordingly shows no weathering effect, as well as exhibiting wide variation in vegetative cover.

B: Brown Soil (Kahverengi Topraklar)

These are calcareous zonal soils of ABC profile.

A and C horizons show slight traces of erosion. This is due to high calcareous content. Also, degree of saturation is high. A_1 horizon is 10~25cm thick and contains a medium degree of organic substance. pH is ranges from neutral or alkaline, and soil color is grayish brown to brown.

B horizon contains round gravels, and color ranges from light to dark brown. Organic content is medium degree. However, lower layer exhibits brown to grayish color as source material is limestone. All layers show calcareous content; however, crystal accumulation of lime is almost entirely absent in B horizon and below . Clay minerals are illite and montmorillonite.

Natural vegetation growth is low to medium degree.

This soil is found in warm, semi-arid areas, and is almost completely in dry condition throughout the year. However, some wetness is present depending on the profile.

Marl, clay shist and limestone are the main source materials. Fine structure alluvial source material is basic rock, claystone and crystobalite.

F: Red Brown Soil (Kirmizi Kahverengi Topraklar)

Except for color, almost all its characteristics are the same or nearly the same with that of the brown soils. The soil is found in hot regions.

A_1 horizon is reddish brown to brown; B horizon is red to reddish brown. Color is not the result of high temperature, but rather oxidation of iron in the soil.

Organic content of A horizon is low due to high temperatures which accelerated decomposition.

U: Non-calcareous Soil (Kirecsiz Kahverengi Topraklar)

These are non-calcareous, brown soils of A(B)C profile. Upper soils are brown or light brown, and exhibit a crumbling structure. B horizon is pale

reddish brown. Upper soil is acidic compared with lower soil. Calcareous content is not present except for localized portions in lower soil.

Natural vegetation is a mixture of grasses and bushes. Soil is found in semiarid to semihumid climates with rainfall at 400~750mm. Principal source substances are sand and clay sediments mixed with weathered rock, and sandy and clayey rock.

CK: Rock and Gravel

These are natural rocks and gravels exposed on the surface.

IV-2 Infiltration Analysis

Infiltration analysis was carried out to get an index of interval for irrigation at the 6 investigation points. However, appropriate results could not be obtained for 3 of these investigation pointsbecause of unsuitable setting of apparatus. The method of infiltration is the cylinder infiltrometer method.

The results of 3 investigation points are shown below.

Results of Infiltration Analysis

Sample No.	Integrated Infiltration (D) ($D=C*T^n$)	Infiltration Velocity (I) ($I=60*C*n*Tn-I$)	Basic (Intake Rate (Ib) (mm/hr)
No.1	C=10.8	n=0.602	44.1
No.2	C=13.0	n=0.498	22.1
No.5	C= 6.35	n=0.343	2.6

Note: T:Time C:Constant Number (D Value at T=1)

In spite of heavy soil in Elbistan - Afsin Plain, basic intake rate shows a relatively high value.

The result suggests that soil in Elbistan - Afsin Plan shows good permeability and short irrigation interval in comparison with present irrigation condition from the view point of plant physiological aspects.

Under present conditions, irrigation interval is controlled by farmers traditional methods, for example 2 week interval for sugar beet and 10 to 15 days for dry bean. The irrigation intervals are based on the traditional practices of farmers. However the results of this analysis suggested that shorter irrigation interval than the present interval term will be effective for plant growth according to the plant pathology.

IV-3 Analysis of Available Water Capacity

Available Water Capacity (AWC) is defined as the volume of water retained between field capacity (FC) and permanent wilting point (PWP) in effective soil layer.

In the Study, the team carried out field survey to confirm the result of DSI. Bulk density, FC and PWP were observed and the RAM was calculated as shown in the table below.

Available Water Capacity (Soil Trench Hole Point)

Sample No	Depth (cm)	FC (%)	PWP (%)	Bulk Density	RAM (mm/30cm)
3	0-23	31.92	19.37	1.28	48.2
4	0-15	30.87	16.74	1.17	49.6
5	0-10	36.68	23.21	1.17	47.3
8	0-14	21.36	10.65	1.29	41.1
13	0-17	18.19	9.64	1.26	32.3
15	0-20	40.19	25.42	1.35	59.8
18	0-22	29.23	17.43	1.16	41.1
19	0-22	38.33	22.99	1.27	58.4
Average		30.62	17.96	1.24	47.51

Available Water Capacity (Auger Hole Point)

Sample No	Depth (cm)	FC (%)	PWP (%)	Bulk Density	RAM (mm/30cm)
3	0-30	25.4	18.4	(1.36)	28.6
	30-60	30.0	20.9	(1.36)	37.1
2	0-30	33.6	25.9	(1.36)	31.4
	30-60	33.6	25.9	(1.36)	31.4
3	0-30	47.2	32.4	(1.36)	37.1
	30-60	47.5	31.8	(1.36)	60.4
5	0-30	29.2	21.0	(1.36)	64.1
	30-60	32.7	23.1	(1.36)	39.2
6	0-30	28.7	21.2	(1.36)	30.6
	30-60	31.5	22.6	(1.36)	36.3
Average	0-30	32.8	23.8	(1.36)	36.9
	30-60	36.7	25.2	(1.36)	42.8

Note: Bulk density was estimated from the average of other samples.

Available Water Capacity (Infiltration Survey Point)

Sample No	Depth (cm)	FC (%)	PWP (%)	Bulk Density	RAM (mm/30cm)
3	0-10	32.1	20.9	1.18	39.8
	30-60	34.9	23.0	1.31	46.9
2	0-10	32.6	21.7	1.36	44.4
	30-60	31.9	21.4	1.28	40.4
3	0-10	29.5	19.5	1.32	39.7
	30-60	30.6	20.3	1.39	43.0
4	0-10	27.2	18.9	1.10	27.4
	30-60	27.9	19.5	1.37	34.7
5	0-10	24.2	12.2	1.62	58.3
	30-60	25.0	14.8	1.72	53.0
6	0-10	26.6	17.5	1.28	34.8
	30-60	25.0	18.7	1.36	25.7
Average	0-10	28.7	18.5	1.31	40.7
	30-60	29.2	19.6	1.41	40.6

IV-4 Cost Estimates for Soil Improvement

Land reclamation works will be necessary in the Project area as shown in the land classification map. Those works area classified as the removal of surface stone and gravel, and land leveling.

The cost of those works are standardized as the unit price by the government of Turkey. According to the land classification map, the area of necessary land reclamation is shown in in the following table.

Distribution of Area to be Improved

Item	Class	Area (ha)	remarks
Removal of Gravel			
	Class 1	3,172	0-100m^3/ha
	Class 2	1,361	100-250m^3/ha
	Class 3	750	250-450m^3/ha
Land Leveling			
	Class 1	2,638	0-500m^3/ha
	Class 2	673	500-1,000m^3/ha
	Class 3	206	1,000-1,500m^3/ha

Upon the completion of river improvement and drainage facilities, in addition to the above works, the future land classification will be changed as follows.

Land Classification (After Improvement)

Land Classification	Area (ha)
Class 1	898
Class 2	25,829
Class 3	13,681
Class 4	2,838
Class 5	784
Potential Cultivated Area	44,030
Class 6	1,035
Urban Area	264
Net Area	45,329

Class 2 and 3 will be improved under public works. The improvement of Class 1 will be carried out by farmers.

The unit price of the removal of surface stone and gravel, and the land leveling are TL 750/m^3 and TL 357/m3 respectively. Based on this unit price, cost estimation of land reclamation works calculated as follows.

1) Cost for removal of Gravel

Class 2

1,361ha × 150m^3/ha × TL 750/m^3 = TL 153,112,500

Class 3

750ha × 350m^3/ha × TL 750/m^3 = TL 196,875,000

2) Cost for land leveling

Class 2

673ha × 750m3/ha × TL 357/m^3 = TL 180,195,750

Class 3

206ha × 1,250m3/ha × TL 357/m^3 = TL 91,927,500

3) Total Cost TL 622,110,750

Table IV- 1
Sheet 1

1. Soil Profile Observartion Point

Sample No.	Location
Site No. 1	The north side of Power Station - Elbistan road (3.7km from Power Station)
Site No. 2	The north west north side from Altinelma (2.5km from Altinelma Village)
Site No. 3	The north side of Emirilyas - Aritas road (4.4 km from Emirilyas Village)
Site No. 4	The south side of Tarlacik - Tanir road (0.7km from Tarlacik Village)
Site No. 5	The north side of tarlacik - Tanir road (0.3 km from Tarlacik Village)
Site No. 6	The south side of Power Station - Elbistan highway (8.7km from Power Station)
Site No. 7	The east side of Izgin Village (0.4 km from Izgin Village)
Site No. 8	The east side of Afsin - Power Station highway (2.5 km from Afsin)
Site No. 9	The south side of Elemik - Hadankendi road (1.6 km from Elemik Village)
Site No. 10	The east side of Elemik - Elbistan road (4.0 km from Y-intersection in the suburbs Elbistan)
Site No. 11	The east side of Karahuyuk - Kuskayasi road (1.1 km from Karahuyuk Village)
Site No. 12	River side of Human River (Intersection of river and Afsin - Power Station highway)
Site No. 13	The south side of Sogucak - Esence road (4.5 km from intersection of Afsin - Goksun road)
Site No. 14	The east side of Tilavsun - Afsin road (0.1 km from Tilavsun Village)
Site No. 15	The east side of Sogucak - Nadir road (0.1 km from Nadir Village)
Site No. 16	The west side of Afsin - Goksun road (2.4 km from the bridge of Goksun river of Afsin - Goksun road)
Site No. 17	The south side of Tanir - Tarlacik road (0.5 km from Tanir Village)
Site No. 18	The east side of kucuk Yapalak - Buyuk Yapalak road (0.5 km from Kucuk Yapalak Village)
Site No. 19	The side of Buyuk Yapalak - Gokcek road (4.2 km from Buyuk Yapalak Village)
Site No. 20	0.3 km east side of Kucuk Yapalak - Buyuk Yapalak road (2.7 km from Kucuk Yapalak Village)
Site No. 21	0.1 km east side of Kucuk Yapalak - Evcihukuk road (6.0 km from Kucuk Yapalak Village)
Site No. 22	The north side of Tanir - Budget road (5.2 km from Tanir Village)
Site No. 23	The east side of Elbistan - Akveren road (0.2 km from Akveren Village)
Site No. 24	The south side of Cobanbeyli - Tanir road (3.0 km from Tanir Village)
Site No. 25	The south side of Incikoy - Tarlacik road (3.0 km from Tarlacik Village)
Site No. 26	The west side of Tarlacik - Tepebashi road (0.5 km from Tepebashi Village)
Site No. 27	The north side of Afsin - Buyuk Sevin old road (2.2 km from Afsin)
Site No. 28	The east side of Afsin - Cobanbeyli old road (2.2 km from Afsin)

2. Soil Augar Survey Point

Sample No.	Location
Site No. 1	The side of intersection to Asagi Tepebashi from Elbistan - Power Station highway
Site No. 2	The east side of Elbistan - Karahuyuk road (1.2 km from Elbistan)
Site No. 3	0.3 km west side from Elbistan - Karahuyuk road (1.5 km from Elbistan)
Site No. 4	The north side from Tarlacik (1.5 km from Tarlacik Village)
Site No. 5	The east side of Cobanbeyli - Tanir road (5.2 km from Hunu river)
Site No. 6	The south side of Afsin - Kerker road (3.1 km from Afsin)

3. Infiltration Observation Point

Sample No.	Location
Site No. 1	The south side of Power Station - Elbistan highway (4.1 km from Power Station)
Site No. 2	The south side of Power Station - Elbistan highway
Site No. 3	0.1 km from Cobanbeyli - Tanir road (0.4 km from Cobanbeyli)
Site No. 4	2.1 km from Karahuyuk - Kuskayasi road 2.9 km from Kuskayasi
Site No. 5	0.3 km from Karahuyuk - Ercen road 1.5 km from Karahuyuk

Table IV- 1
Sheet 3

4. Water Quality Observation Point

Sample No.	Location	Sampling
Site No. 1	Hurman River, at the Karakzu Dam point	Oct. 1988
Site No. 2	Hurman River, at the Karakzu Dam point	Jul. 1989
Site No. 3	Tanir Spring, at Tanir Village	Oct. 1988
Site No. 4	Tanir Spring, at Tanir Village	Jul. 1989
Site No. 5	Groundwater at Power Station Limestone	Oct. 1988
Site No. 6	Groundwater at Power Station Limestone	Jul. 1989
Site No. 7	Groundwater at Power Station Quarternary Sediments	Oct. 1989
Site No. 8	Groundwater at Power Station Quarternary Sediments	Jul. 1989
Site No. 9	Aritas Spring, at Aritas Village	Oct. 1988
Site No. 10	Hurman River, at the intersection of Power Station - Afsin road	Oct. 1988
Site No. 11	Hurman River, at the intersection of Power Station - Afsin road	Jul. 1989
Site No. 12	Hurman River, at the river near Guvercinuk Village	Jul. 1989
Site No. 13	Hurman River, at the canal near Guvercinuk Village	Jul. 1989
Site No. 14	Sogutlu River,40 km from Elbistan	Oct. 1988
Site No. 15	Sarsap River, at the intersection of Power Station - Elbistan road	Oct. 1988
Site No. 16	Sarsap River, at the intersection of Power Station - Elbistan road	Jul. 1989
Site No. 17	Izgin Spring, at the Izgin Village	Oct. 1988
Site No. 18	Pinarbasi Spring, at the south of Elbistan	Oct. 1988
Site No. 19	Ceyhan River, at the intersection of Afsin - Elbistan road	Oct. 1988
Site No. 20	Ceyhan River, at the intersection of Afsin - Elbistan road	Jul. 1989
Site No. 21	Goksun River, at the intersection of Afsin - Goksun road	Oct. 1988
Site No. 22	Goksun River, at the intersection of Afsin - Goksun new road	Jul. 1989
Site No. 23	Goksun River, at the Adatepe Dam site	Oct. 1988
Site No. 24	Goksun River, at the Adatepe Dam site	Jul. 1989
Site No. 25	Goksun River,at the saddle dam site of Adatepe Dam	Jul. 1989

SOIL PROFILE OBSERVATION (Site No. 1)

Sampling Location: The south side of Sogucak - Esence road
(4.5 km from intersection of Afsin - Goksun road)

Sampling Date: 28th Oct. 1988

Topography: Hill

Slope: Rolling

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 11	Brown(7.5YR 4/5, moist); clay with moderate granular structure; roots; clear smooth horizon boundary
11 - 42	Brown(7.5YR 4/6); clay with strong angular blocky structure; easy breaking with water addition; few fissure; gradual wavy horizon boundary
42 - 94	Brown(7.5YR 4/6, moist); clay with strong angular blocky structure
94 -	Rock

SOIL PROFILE OBSERVATION (Site No. 2)

Sampling Location: The east side of Sogucak - Nadir road
(0.1 km from Nadir Village)

Sampling Date: 27th Oct. 1988

Topography: Hill

Slope: Undulating

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 24	Brown(7.5YR 4/3, moist); clay with weak subangular blocky structure; roots; gradual smooth horizon boundary
24 - 51	Brown(7.5YR 4/3, moist); clay with moderate subangular blocky structure; gradual wavy horizon boundary
51 - 88	Brown(7.5YR 4/4, moist); clay with strong subangular blocky structure; faint few mottles of calcium carbonate; diffuse smooth horizon boundary
88 -148	Brown(7.5YR 4.4, moist); clay with strong subangular blocky structure

SOIL PROFILE OBSERVATION (Site No. 3)

Sampling Location: The west side of Afsin - Goksun road
(2.4 km from the bridge of Goksun river of Afsin - Goksun road)

Sampling Date: 28th Oct. 1988

Topography: Alluvial plain

Slope: Level

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 23	Dark grayish yellow(2.5Y 4/2, moist); clay with granular structure; roots; diffuse smooth horizon boundary
23 -120	Dark grayish yellow(2.5Y 4/2, moist); heavy clay with structureless of massive

SOIL PROFILE OBSERVATION (Site No. 4)

Sampling Location: The east side of Tilavsun - Afsin road
(0.1 km from Tilavsun Village)

Sampling Date: 27th Oct. 1988

Topography: Hill

Slope: Rolling

Present Land Use: Cultivated Area(Chick pea)

Depth(cm)	Description
0 - 15	Dull yellow brown(10YR 5/4, moist); clay with moderate granular structure; roots; clear smooth horizon boundary
15 - 38	Brown(10YR 4/6, moist); clay with strong subangular blocky structure; easy breaking with water addition; roots; clear wavy horizon boundary
38 - 63	Brown(7.5YR 4/6, moist); clay with strong angular blocky structure; few pore; easy breaking with water addition; gradual smooth horizon boundary
63 -110	Brown(7.5YR 4/6, moist); clay with moderate angular blocky structure

Table IV- 2
Sheet 2

SOIL PROFILE OBSERVATION (Site No. 5)

Sampling Location: The east side of Afsin - Power Station highway (2.5 km from Afsin)

Sampling Date: 20th Oct. 1988

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 10	Dark reddish brown(5YR 3/6, moist); clay with moderate granular structure; roots; clear smooth horizon boundary
10 - 52	Dull reddish brown(2.5yr 4/4, moist); clay with strong prismatic structure; faint few molltes of calcium carbonate; roots; clear wavy horizon boundary
52 - 92	Dark reddish brown(2.5YR 3/4, moist); clay with weak prismatic structure and moderate angular blocky structure; faint few mottles of calcium carbonate; gradual wavy horizon boundary
92 -140	Dark reddish brown(2.5YR 3/4, moist); clay with moderate angular blocky structure; faint few mottles of calcium carbonate

SOIL PROFILE OBSERVATION (No. 6)

Sampling Location: The north side of Afsin - Buyuk Sevin old road (2.2 km from Afsin)

Sampling Date: 4th Aug. 1989

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Non-cultivated Area

Depth(cm)	Description
0 - 16	Dark reddish brown(2.5YR 3/5, moist) or dark reddish brown(2.5YR 3/6, dry); clay with moderate subangular blocky structure; few gravely subrounded fragment; roots; clear smooth horizon boundary
16 - 34	Dark red(10YR 3/6, moist); clay with moderate angular blocky structure; gravely subrounded fragment; roots; gradual smooth horizon boundary
34 - 60	Dark red(10R 3/6, moist); clay with strong angular blocky structure; very gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 7)
Sampling Location: The east side of Afsin - Cobanbeyli old road
(2.2 km from Afsin)
Sampling Date: 4th Aug. 1989
Topography: Alluvial fan
Slope: Undulating
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 22	Dark reddish brown(5YR 3/6, moist) or reddish brown(5yr 4/8, dry); sandy clay loam with moderate granular structure; roots; clear smooth horizon boundary
22 - 48	Dark reddish brown(5YR 3/6, moist) or reddish brown(5YR 4/8, dry); sandy clay loam with weak subangular blocky structure; roots; gradual smooth horizon boundary
48 - 92	Dark reddish brown(2.5YR 3/4, moist) or dark reddish brown(2.5YR 3/6, dry); sandy clay with strong angular blocky structure; gravely subrounded fragment; gradual wavy horizon boundary
92 -110	Dark brown(2.5YR 3/5, moist); clay with strong angular blocky structure; gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 8)
Sampling Location: The north side of Emirilyas - Aritas road
(4.4 km from Emirilyas Village)
Sampling Date: 27th Oct. 1988
Topography: Alluvial fan
Slope: Gently sloping
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 -14	Brown(7.5YR 4/6, moist); clay loam with moderate granular structure; roots; gradual smooth horizon boundary
14 - 86	Dull reddish brown(5YR 4/4, moist); clay with moderate angular blocky structure; very gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 9)

Sampling Location: The north west north side from Altinelma (2.5km from Altinelma Village)

Sampling Date: 27th Oct. 1988

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 12	Dull reddish brown(5YR 4/4, moist); clay with moderate granular structure; few gravely subrounded fragment; roots; clear smooth horizon boundary
12 - 44	Dull reddish brown(5YR 4/5, moist); clay with moderate angular blocky structure; gravely subrounded fragment; roots; diffuse wavy horizon boundary
44 - 50	Dull reddish brown(5YR 4/5, moist): clay with moderate angular blocky structure; very gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 10)

Sampling Location: The south side of Cobanbeyli - Tanir road (3.0 km from Tanir Village)

Sampling Date: 20th Jul. 1989

Topography: Alluvial fan

Slope: Gentle sloping

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 13	Brown(10YR 4/4, moist) or dull yellow brown(10YR 5/4, dry); clay with moderate granular structure; roots; clear smooth horizon boundary
13 -62	Brown(10YR 4/4, moist); clay with strong angular blocky structure; few mottles(10YR 4/6); roots; diffuse wavy horizon boundary
62 -112	Brown(10YR 4/6, moist); clay with strong angular blocky structure; common mottles (10YR 4/6); roots; gradual wavy horizon boundary
112 -120	White(10Y 8/1, moist); clay with structureless of massive; many mottles(10YR 4/6); weathered limestone

SOIL PROFILE OBSERVATION (Site No. 11)
Sampling Location: The south side of Incikoy - Tarlacik road
(3.0 km from Tarlacik Village)
Sampling Date: 20th Jul. 1989
Topography: Hill
Slope: Undulating
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 -17	Brown(10YR 4/5, moist) or dull yellow brown(10YR 5/4, dry); sandy clay with moderate granular structure; roots; clear smooth horizon boundary
17 - 41	Brown(10YR 4/6, moist); sandy clay with moderate subangular blocky structure; few mottles(white) of calcium carbonate; roots; gradual smooth horizon boundary
41 - 66	Dull yellow orange(10YR 5.5/3, moist); sandy clay with weak subangular blocky structure; few mottles(10YR 8/3) of carbonate carbonate; gradual wavy horizon boundary
66 -114	Brown(7.5YR 4.5/6, moist); sandy loamy clay with weak subangular blocky structure; common mottles(10YR 8/3) of calcium carbonate and few mottles(black); gradual wavy horizon boundary
114 -150	Brown(10YR 4/4, moist); sandy loamy clay with weak subangular blocky structure; common mottles(10YR 8/3) of calcium carbonate and many mottles(black)

SOIL PROFILE OBSERVATION (Site No. 12)
Sampling Location: The west side of Tarlacik - Tepebashi road
(0.5 km from Tepebashi Village)
Sampling Date: 20th Jul. 1989
Topography: Alluvial fan
Slope: Level
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 14	Dull reddish brown(5YR 4/6, moist) or light reddish brown(5YR 5/6, dry); clay with moderate granular blocky structure; roots; clear smooth horizon boundary
14 - 75	Dull reddish brown(5YR 4/6, moist); clay with moderate subangular blocky structure; few mottles(white) of calcium carbonate; gradual wavy horizon boundary
75 -122	Reddish brown(5YR 4/8, moist); clay with moderate subangular blocky structure; few mottles(white) of calcium carbonate; gradual wavy horizon boundary
122 -133	Light brown(7.5YR 5/7, moist); clay with moderate subangular blocky structure; many mottles(7.5YR 8/3) of calcium carbonate

SOIL PROFILE OBSERVATION (Site No. 13)

Sampling Location: River side of Human River
(Intersection of river and Afsin - Power Station highway)

Sampling Date: 21st Oct. 1988

Topography: River bed

Slope: level

Present Land Use: Non-cultivated Area

Depth(cm)	Description
0 - 17	Grayish brown(7.5YR 5/2, moist); sandy loam with moderate granular structure; few gravely subrounded fragment; roots; abrupt smooth horizon boundary
17 - 42	Grayish brown(7.5YR 5/2, moist); loam with moderate subangular blocky structure; few gravely subrounded fragment; roots; pore; gradual wavy horizon boundary
42 - 66	Grayish yellow brown(10YR 4/2, moist): loamy sand with structureless of single grain; roots; clear wavy horizon boundary
66 -90	Dull yellow brown(10YR 4/3, moist); silty clay loam or clay loam with weak angular blocky structure; gradual smooth horizon boundary
90 - 116	Dull yellow brown(10YR 4/3, moist); clay loam with weak angular blocky structure; few pore; abrupt smooth horizon boundary
116 -153	Grayish yellow brown(10YR 4/2, moist); loamy sand with weak angular blocky structure; few gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 14)

Sampling Location: The north side of Power Station - Elbistan road
(3.7km from Power Station)

Sampling Date: 21st Oct. 1988

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 -13	Reddish brown(5YR 4/6, moist); clay with moderate crumb structure; few mottles of calcium carbonate; roots; abrupt smooth horizon boundary
13 -62	Reddish brown(5YR 4/6, moist); heavy clay with moderate angular block structure; common mottles of calcium carbonate; roots; gradual wavy horizon boundary
62 -119	Reddish brown(5YR 4/6, moist); heavy clay with moderate angular blocky structure; many mottles of calcium carbonate

SOIL PROFILE OBSERVATION (Site No. 15)
Sampling Location: The south side of Power Station - Elbistan highway
(8.7km from Power Station)
Sampling Date: 21st Oct. 1988
Topography: Alluvial fan
Slope: Gently sloping
Present Land Use:Cultivated Area(Wheat)

Depth(cm)	Description
0 - 20	Brown(10YR 4/4, moist); clay loam or silty clay with moderate granular structure; roots; clear smooth horizon boundary
20 - 45	Dull yellow brown(10YR 5/4, moist); silty clay or clay with moderate subangular blocky structure; roots; gradual smooth horizon boundary
45 - 85	Dull brown(7.5YR 5/6, moist); clay with moderate subangular blocky structure; roots; gradual wavy horizon boundary
85 -103	Dull brown(7.5YR 5/6, moist); clay with moderate angular blocky structure; roots gradual wavy horizon boundary
103 -135	Brown(7.5YR 4/6, moist); clay with moderate angular blocky structure

SOIL PROFILE OBSERVATION (Site No. 16)
Sampling Location: The east side of Karahuyuk - Kuskayasi road
(1.1 km from Karahuyuk Village)
Sampling Date: 21st Oct. 1988
Topography: Alluvial plain
Slope: Level
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 27	Dark brown(10YR 3/4, moist); clay with moderate granular structure; roots; gradual smooth horizon boundary
27 - 74	Dark brown(10YR 3/4, moist); clay with moderate subangular blocky structure; roots; gradual smooth horizon boundary
74 -106	Dark brown(10YR 3/4, moist); sandy clay with weak subangular blocky structure; diffuse smooth horizon boundary
106 -150	Dark brown(10YR 3/4, moist); silty clay with weak subangular blocky structure

SOIL PROFILE OBSERVATION (Site No. 17)
Sampling Location: The east side of Izgin Village
(0.4 km from Izgin Village)
Sampling Date: 21st Oct. 1988
Topography: Alluvial plain
Slope: level
Present Land Use: Cultivated Area(Wheat)
Ground Water Level: 100 cm

Depth(cm)	Description
0 - 26	Dark brown(10YR 3/3, moist); clay with moderate granular structure; few gravely subrounded fragment; roots; few pore; gradual smooth horizon boundary
26 - 54	Dull yellow brown(10YR 4/3, moist); clay with moderate subangular blocky structure; few gravely subrounded fragment; roots; gradual smooth horizon boundary
54 - 79	Dull reddish brown(2.5YR 4/3, moist); clay with moderate angular blocky stricture; diffuse smooth horizon boundary
79 -100	Dull reddish brown(2.5YR 5/3, wet); loamy sand or sand with structureless of single grain
100 -115	(by auger hole) sand
115 -200	(by auger hole) Heavy clay

SOIL PROFILE OBSERVATION (Site No. 18)
Sampling Location: The south side of Elemik - Hadankendi road
(1.6 km from Elemik Village)
Sampling Date: 28th Oct. 1988
Topography: Alluvial plain
Slope: level
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 22	Dull yellow brown(10YR 4/3, moist); clay with weak angular blocky structure; roots; gradual smooth horizon boundary
22 - 38	Dull yellow orange(10YR 6/3, moist); clay with moderate angular blocky structure; roots: gradual smooth horizon boundary
38 - 53	Dull yellow brown(10YR 5/4, moist); sandy clay with weak angular blocky structure; gradual smooth horizon boundary
53 - 73	Dull yellow brown(10YR 5/3, moist); clay with weak granular structure; gradual wavy horizon boundary
73 -120	Dull yellow brown(10YR 5/4, moist); clay with weak angular blocky structure

SOIL PROFILE OBSERVATION (Site No. 19)
Sampling Location: The east side of Elemik - Elbistan road
(4.0 km from Y-intersection in the suburbs Elbistan)
Sampling Date: 28th Oct. 1988
Topography: Alluvial plain
Slope: level
Present Land Use: Cultivated Area(Wheat)
Groundwater level: 74 cm

Depth(cm)	Description
0 - 22	Dark grayish yellow(2.5Y 5/2, moist); clay with weak subangular blocky structure; roots; gradual smooth horizon boundary
22 - 40	Grayish yellow(2.5Y 6/3, moist); heavy clay with weak subangular blocky structure; diffuse smooth horizon boundary
40 - 74	Grayish yellow(2.5Y 6/3, wet); heavy clay with structureless of massive; diffuse smooth horizon boundary
74 -154	(by auger hole) light yellow(2.5Y 7/3); heavy clay with structureless of massive

SOIL PROFILE OBSERVATION (Site No. 20)
Sampling Location: The east side of Elbistan - Akveren road
(0.2 km from Akveren Village)
Sampling Date: 19th Jul. 1989
Topography: Alluvial plain
Slope: Level
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 -14	Brown(10YR 6/3, moist) or dull yellow brown(10YR 4/3, dry); silty clay with moderate granular structure; few gravely subrounded fragment; roots; clear smooth horizon boundary
14 - 28	Dull yellow orange(10YR5/4, moist); clay with strong angular blocky structure; roots; gradual wavy horizon boundary
28 - 54	Dull yellow brown(10YR 4/3, moist); clay with moderate angular blocky structure; gradual smooth horizon boundary
54 - 79	Brown(10YR4/4, moist); clay with moderate subangular blocky structure; few mottles (5YR 3/4); diffuse wavy horizon boundary
79 -105	Brown(10YR 4/5, moist); clay with moderate subangular blocky structure; few molltes (10YR 3/4); diffuse smooth horizon boundary
105 -120	(by auger hole) clay

SOIL PROFILE OBSERVATION (Site No. 21)

Sampling Location: 0.1 km east side of Kucuk Yapalak - Evcihukuk road
(5.9 km from Kucuk Yapalak Village)

Sampling Date: 19th Jul. 1989

Topography: Alluvial fan

Slope: gently sloping

Present Land Use: Cultivated Area(Chick pea)

Depth(cm)	Description
0 - 21	Light brown(7.5YR 5/6, moist) or Dull orange (7.5YR 7/3, dry); clay with moderate granular structure; roots; clear smooth horizon boundary
21 - 30	Dull brown(7.5YR 5/5, moist); clay with moderate subangular blocky structure; gradual smooth horizon boundary
30 - 72	Brown(7.5YR 4/6,moist); clay with moderate subangular blocky structure; gradual wavy horizon boundary
72 -125	Brown(7.5YR 4/6, moist); clay with moderate subangular blocky structure; common mottles (7.5YR 8/3) of calcium carbonate

SOIL PROFILE OBSERVATION (Site No. 22)

Sampling Location: The east side of kucuk Yapalak - Buyuk Yapalak road
(0.5 km from Kucuk Yapalak Village)

Sampling Date: 19th Jul. 1989

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 12	Grayish yellow brown(10YR 6/2, dry); sandy loam with weak subangular blocky structure; roots; gravely subrounded fragment of limestone; gradual smooth horizon boundary
12 - 22	Grayish yellow brown(10YR 6/2, dry); sandy loam with moderate subangular blocky structure; very gravely subrounded fragment of limestone; abrupt wavy horizon boundary
22 -54	Dull yellow orange(10YR 7/2, dry); loam; weathered material of limestone

SOIL PROFILE OBSERVATION (Site No. 23)

Sampling Location: 0.3 km east side of Kucuk Yapalak - Buyuk Yapalak road
(2.4 km from Kucuk Yapalak Village)

Sampling Date: 19th Jul. 1989

Topography: Alluvial fan

Slope: Level

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 19	Dull brown(7.5YR 5/4, moist) or dull yellow orange(10YR 6/3, dry); clay with moderate granular structure; roots; clear smooth horizon boundary
19 -50	Dull yellow brown(10YR 5/3, moist); clay with strong angular blocky structure; roots; gradual wavy horizon boundary
50 - 75	Dull yellow brown(10YR 5/3, moist); silty clay with string angular blocky structure; roots; gradual wavy horizon boundary
75 - 93	Dark brown(10YR 3/4, moist); sandy clay with weak subangular blocky structure; diffuse smooth horizon boundary
93 -150	Brown(7.5YR 4/4, moist); sandy clay with weak subangular blocky structure; few gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 24)

Sampling Location:The side of Buyuk Yapalak - Gokcek road
(4.2 km from Buyuk Yapalak Village)

Sampling Date: 19th Jul. 1989

Topography: Alluvial fan

Slope: Gently sloping

Present Land Use: Non-cultivated Area

Depth(cm)	Description
0 - 12	Dull yellow orange(10YR 7/3, dry); silty loam with moderate granular structure and moderate subangular blocky structure; few gravely subrounded fragment; gradual smooth horizon boundary
12 - 62	Dull yellow brown(10YR 5/3, moist); silty loam with moderate subangular blocky structure: gravely subrounded fragment; gradual wavy horizon boundary
62 - 72	Dull yellow brown(10YR 5/3, moist); loam with moderate subangular blocky structure; many mottles(10YR 7/2) of calcium carbonate;gravery subrounded fragment; gradual smooth horizon boundary
72 -108	Dull yellow brown(10YR 5/4, moist); sandy loam with weak subangular blocky structure; common mottles(10YR 7/2, 10YR 4/2) of calcium carbonate; gravely subrounded fragment; gradual wavy horizon boundary
108 -122	yellow brown(10YR 5/6, moist); sandy loam with weak subangular blocky structure; common gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 25)

Sampling Location: The north side of tarlacik - Tanir road
(0.3 km from Tarlacik Village)

Sampling Date: 20th Oct. 1988

Topography: Hill

Slope: Hilly

Present Land Use: Non-cultivated Area

Depth(cm)	Description
0 - 12	Brown(7.5YR 4/3, moist); clay with moderate granular structure; few gravely subrounded fragment; roots; gradual smooth horizon boundary
12 - 34	Grayish brown(7.5YR 4/2.5, moist); clay with moderate subangular blocky structure; few gravely subrounded fragment; roots; few pore; gradual wavy horizon boundary
34 - 56	Brown(7.5YR 4/4, wet); clay with moderate angular blocky structure; few gravely subrounded fragment; roots;gradual wavy horizon boundary
56 -113	Brown(7.5YR 4/4, wet); clay with moderate angular blocky structure; common mottles; few gravely subrounded fragment;near ground water level

SOIL PROFILE OBSERVATION (Site No. 26)

Sampling Location: The south side of Tanir - Tarlacik road
(0.5 km from Tanir Village)

Sampling Date: 28th Oct. 1988

Topography: Hill

Slope: Undulating

Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 14	Brown(7.5YR 4/6, moist); moderate granular structure; common gravely subrounded fragment; roots; gradual smooth horizon boundary
14 - 37	Brown(7.5YR 4/6, moist); moderate subangular blocky structure; very gravely subrounded fragment

SOIL PROFILE OBSERVATION (Site No. 27)
Sampling Location: The south side of Tarlacik - Tanir road
(0.7km from Tarlacik Village)
Sampling Date: 20th Oct. 1988
Topography: Alluvial fan
Slope: Undulating
Present Land Use: Cultivated Area(Wheat)

Depth(cm)	Description
0 - 16	Brown(7.5YR 4/4, moist); clay with moderate granular structure; roots; clear smooth horizon boundary
16 - 64	Brown(7.5YR 4.5/4, moist); sandy clay with moderate subangular blocky structure; roots; diffuse wavy horizon boundary
64 -118	Dull yellow orange(10YR 7/3, moist); clay with massive structureless

SOIL PROFILE OBSERVATION (Site No. 28)
Sampling Location: The north side of Tanir - Budget road
(5.2 km from Tanir Village)
Sampling Date: 20th Jul.1989
Topography: Hill
Slope: Gently sloping
Present Land Use: Cultivated Area(Chick pea)

Depth(cm)	Description
0 - 10	Brown(7.5YR 4/4, moist) or dull brown(7.5YR 5/3, dry); sandy loam with moderate granular structure; roots; clear smooth horizon boundary
10 - 26	Brown(7.5YR 4/4, moist); sandy clay with strong angular blocky structure; few mottles(7.5YR 8/2) of calcium carbonate; roots; gradual smooth horizon boundary
26 - 61	Dull brown(7.5YR 4/5, moist); sandy loam with moderate subangular blocky structure; few mottles(7.5YR 8/2) of calcium carbonate; gradual wavy horizon boundary
61 - 99	Brown(7.5YR 4.5/6, moist); clay with strong subangular blocky structure; few mottles (7.5YR 8/2) of calcium carbonate; gradual wavy horizon boundary
99 -150	Dull orange(7.5YR 6/4, moist); sandy clay with strong subangular blocky structure; common mottles(7.5YR 8/3) of calcium carbonate

Summary of Chemical and Physical Analysis of The Soil

1 Soil Chemical Analysis

Sample No.	Location of sampling	Sat. %	pH (25℃)	EC (μ S/cm)	CEC (me/100g)	Exch. Cation (me/100g) Na	K	Ma+Ca	ESP* (%)
3	Alluvial of Goksun River	49	7.7	0.660	23.46	0.32	1.23	24.26	1.36
4	100 m North from Tilavsan	51	7.7	0.720	33.38	0.29	1.08	33.65	0.87
5	1.5km N-E from Afsin	61	7.7	0.840	53.04	0.28	1.79	51.32	0.53
8	4.4km N-W from Emirilyas	43	7.6	0.840	17.38	0.29	0.47	18.12	1.67
9	2.5km North from Lorsun	51	7.6	0.660	36.16	0.29	1.23	36.05	0.80
13	Alluvial of Hurman River	38	7.7	1.247	19.46	0.35	1.01	19.85	1.80
15	8.7km S-E from Power Station	70	7.8	0.610	39.64	0.40	1.09	39.85	1.01
18	1.6 km South-West from Elemik	49	7.7	0.470	33.38	0.33	1.31	34.76	0.99
19	0.1km South from Elemik	60	7.8	0.898	22.06	0.42	0.95	22.18	1.90

Sample No.	Location of sampling	Soluble Cations & Anions Na	K	Mg+Ca	Cl	CO3	HCO3
3	Alluvial of Goksun River	0.02	0.01	0.343	0.073	0.00	0.171
4	100 m North from Tilavsan	0.01	0.02	0.357	0.051	0.00	0.178
5	1.5km N-E from Afsin	0.02	0.01	0.488	0.061	0.00	0.183
8	4.4km N-W from Emirilyas	0.01	0.01	0.387	0.043	0.00	0.215
9	2.5km North from Lorsun	0.01	0.01	0.357	0.051	0.00	0.153
13	Alluvial of Hurman River	0.03	0.03	0.456	0.133	0.00	0.152
15	8.7km S-E from Power Station	0.06	0.01	0.350	0.070	0.00	0.210
18	1.6 km South-West from Elemik	0.01	0.01	0.245	0.049	0.00	0.098
19	0.1km South from Elemik	0.02	0.01	0.420	0.120	0.00	0.180

ESP: Exchangeable Sodium Persentage

2 Soil Physical Analysis

Sample No.	Location of sampling	Mechanical Analysis				Bulk	Soil Moisture(%)		Avaibable	R.A.M.
		Sand	Silt	Clay	Texture	Density	1/3 bar	15 bar	Moisture Contents	(mm/30cm)
3	Alluvial of Goksun River	25.2	41.6	33.2	Clay Loam	1.28	31.92	19.37	12.55	48.2
4	100 m North from Tilavsan	23.2	38.6	37.2	Clay Loam	1.17	30.87	16.74	14.13	49.6
5	1.5km N-E from Afsin	29.2	27.6	43.2	Clay	1.17	36.68	23.21	13.47	47.3
8	4.4km N-W from Emirilyas	39.2	35.6	25.2	Loam	1.29	21.36	10.65	10.71	41.4
9	2.5km North from Lorsun	33.2	5.6	61.2	Clay	1.25	29.44	16.15	13.29	49.8
13	Alluvial of Hurman River	61.2	27.6	11.2	Sand Clay	1.26	18.19	9.64	8.55	32.3
15	8.7km S-E from Power Station	17.2	37.6	45.2	Clay	1.35	40.19	25.42	14.77	59.8
18	1.6 km South-West from Elemik	-	-	-	-	1.16	29.23	17.43	11.80	41.1
19	0.1km South from Elemik	17.2	37.6	45.2	Clay	1.27	38.33	22.99	15.34	58.4

3 Soil Analysis

No.	Soil Depth	Sampne No.	Sat. (%)	Total Soluble Salts(%)	pH	Mechanical Analysis				Bulk Density	Mopisture (%)		Avaibable Moisture Contents	RAM (mm/30cm)
						Sand	Silt	Clay	Texture		0.3 bar	15 bar		
JAE121	0-10	Infiltration No. 1	49.0	0.060	7.49	15.4	20.8	63.8	C	1.18	32.1	20.9	11.2	39.8
JAE122	30-60		52.0	0.065	7.67	14.5	16.9	69.6	C	1.31	34.9	23.0	11.9	46.9
JAE101	0-10	Infiltration No. 2	44.6	0.260	7.40	7.9	25.2	66.9	C	1.36	32.6	21.7	10.9	44.4
JAE102	30-60		42.0	0.100	7.62	8.8	22.2	69.0	C	1.28	31.9	21.4	10.5	40.4
JAE111	0-10	Infiltration No. 3	45.0	0.080	7.57	13.1	25.5	61.4	C	1.32	29.5	19.5	10.0	39.7
JAE112	30-60		43.2	0.065	7.65	8.5	34.5	57.0	C	1.39	30.6	20.3	10.3	43.0
JAE161	0-10	Infiltration No. 4	46.0	0.275	7.31	12.7	25.1	62.2	C	1.10	27.2	18.9	8.3	27.4
JAE162	30-60		49.6	0.125	7.70	14.0	21.9	64.1	C	1.37	27.9	19.5	8.4	34.6
JAE171	0-10	Infiltration No. 5	49.0	0.047	7.61	28.4	35.2	36.4	CL	1.62	24.2	12.2	12.0	58.3
JAE172	30-60		43.0	0.040	7.68	25.0	33.2	41.8	C	1.73	25.0	14.8	10.2	53.0
JAE181	0-10	Infiltration No. 6	54.0	0.065	7.50	15.2	29.5	55.3	C	1.28	26.6	17.5	9.1	34.8
JAE182	30-60		53.8	0.040	7.70	15.4	34.5	50.1	C	1.36	25.0	18.7	6.3	25.7

4 Soil Moisture Analysis

No.	Depth	Sample No.	Can Volumme (cm3)	Before Drying (g)	After Drying (g)	Bulk Density	Water Contents (g)	Water Contents (%)
JAE121	0-30	Infiltration No. 1	100	150.66	118.31	1.18	32.4	21.47
JAE122	30-60		100	166.62	131.32	1.31	35.3	21.19
JAE101	0-30	Infiltration No. 2	100	178.16	135.86	1.36	42.3	23.74
JAE102	30-60		100	166.27	128.19	1.28	38.1	22.90
JAE111	0-30	Infiltration No. 3	100	169.35	132.40	1.32	37.0	21.82
JAE112	30-60		100	174.87	139.22	1.39	35.7	20.39
JAE161	0-30	Infiltration No. 4	100	138.67	110.11	1.10	28.6	20.60
JAE162	30-60		100	171.11	137.25	1.37	33.9	19.79
JAE171	0-30	Infiltration No. 5	100	193.61	161.81	1.62	31.8	16.42
JAE172	30-60		100	206.26	173.13	1.73	33.1	16.06
JAE181	0-30	Infiltration No. 6	100	159.59	127.51	1.28	32.1	20.10
JAE182	30-60		100	167.29	135.92	1.36	31.4	18.75
				170.205				

5 Soil Analysis

No.	Soil Depth (cm)	Sample No.	Sat.% by Weight	pH	Total Soluble Salts(%)	Mechanical Analysis(%) Sand	Silt	Clay	Texture	Bulk Density	Mopisture % 0.3 bar	15 bar	Available Moisture Contents	RAM (mm/30cm)
JAE211	0- 30	Auger Hole No. 1	44.2	7.55	0.075	23.0	21.6	55.4	C	(1.36)	25.4	18.4	7.0	28.6
JAE212	30- 60		46.0	7.71	0.050	21.5	17.6	60.9	C	(1.36)	30.0	20.9	9.1	37.1
JAE213	60- 90		53.0	7.63	0.050	-	-	-	-	-	-	-	-	-
JAE191	0- 30	Auger Hole No. 2	50.0	7.64	0.070	8.5	22.4	69.1	C	(1.36)	33.6	25.9	7.7	31.4
JAE192	30- 60		55.4	7.61	0.085	7.6	21.6	70.8	C	(1.36)	36.8	27.7	9.1	37.1
JAE193	60- 90		68.0	7.70	0.080	-	-	-	-	-	-	-	-	-
JAE194	90-110		55.0	7.78	0.090	-	-	-	-	-	-	-	-	-
JAE141	0- 30	Auger Hole No. 3	86.0	7.77	0.200	3.8	23.1	73.1	C	(1.36)	47.2	32.4	14.8	60.4
JAE142	30- 60	(Salt Affected Area - 2)	65.4	7.83	0.450	6.1	25.7	68.2	C	(1.36)	47.5	31.8	15.7	64.1
JAE143	60- 90		88.0	7.70	0.020	-	-	-	-	-	-	-	-	-
JAE144	90-120		88.0	7.60	0.120	-	-	-	-	-	-	-	-	-
JAE131	0- 30	Auger Hole No. 4	80.2	7.80	0.425	-	-	-	-	-	-	-	-	-
JAE132	30- 60	(Salt Affected Area - 1)	99.0	8.47	0.175	-	-	-	-	-	-	-	-	-
JAE133	60- 90		56.0	8.20	0.155	-	-	-	-	-	-	-	-	-
JAE134	90-120		53.2	7.89	0.085	-	-	-	-	-	-	-	-	-
JAE201	0- 30	Auger Hole No. 5	53.0	7.70	0.100	16.0	23.1	60.9	C	(1.36)	28.2	21.0	8.2	33.5
JAE202	30- 60		58.2	7.80	0.065	16.1	20.7	63.2	C	(1.36)	32.7	23.1	9.6	39.2
JAE203	60- 90		55.0	7.78	0.060	-	-	-	-	-	-	-	-	-
JAE204	90-120		53.2	7.30	0.060	-	-	-	-	-	-	-	-	-
JAE151	0- 30	Auger Hole No. 6	48.6	7.36	0.070	17.6	19.8	62.6	C	(1.36)	28.7	21.2	7.5	30.6
JAE152	30- 60		62.0	7.70	0.065	17.0	16.8	67.2	C	(1.36)	31.5	22.6	8.9	36.3
JAE153	60- 90		53.6	7.62	0.085	-	-	-	-	-	-	-	-	-
JAE154	90-120		55.4	7.55	0.065	-	-	-	-	-	-	-	-	-

Remark: Bulk Density was estimated from the average of the results of the data of Infiltration samples which measured from real results

Table IV-3 Sheet 3

6 Soil Moisture Analysis

No.	Soil Depth (cm)	Sample No.	Before Drying (g)	After Drying (g)	Water Contents (g)	Water Contents (%)
JAE211	0-30	Auger Hole No. 1	30.37	27.83	2.54	8.4
JAE212	30-60		38.65	33.44	5.21	13.5
JAE213	60-90		39.41	34.22	5.19	13.2
JAE191	0-30	Auger Hole No. 2	50.81	43.48	7.33	14.4
JAE192	30-60		33.78	27.68	6.10	18.1
JAE193	60-90		37.52	30.07	7.45	19.9
JAE194	90-110		29.89	24.25	5.64	18.9
JAE131	0-30	Auger Hole No. 4	29.84	23.90	5.94	19.9
JAE132	30-60	(Salt Affected Area - 1)	28.13	21.09	7.04	25.0
JAE133	60-90		26.12	20.02	6.10	23.4
JAE134	90-120		36.79	28.64	8.15	22.2
JAE201	0-30	Auger Hole No. 5	23.22	20.49	2.73	11.8
JAE202	30-60		37.68	32.08	5.60	14.9
JAE203	60-90		31.13	26.63	4.50	14.5
JAE204	90-120		28.30	22.42	5.88	20.8
JAE151	0-30	Auger Hole No. 6	45.79	38.95	6.84	14.9
JAE152	30-60		39.02	33.42	5.60	14.4
JAE153	60-90		39.14	33.30	5.84	14.9
JAE154	90-120		26.35	22.34	4.01	15.2

7 Soil Physical Analysis (by DSI)

Sample No.	Depth (cm)	Mechanical Analysis				Sat. % (%)	Bulk Density	RAM (mm/30cm)
		Sand	Silt	Clay	Texture			
D-23	0-30	22.6	34.0	43.4	Clay	52	1.30	51.4
	30-60	-	-	-	-	54	1.31	54.9
D-34	0-30	25.6	33.0	41.4	Clay	44	1.38	62.6
	30-60	21.6	25.0	53.4	Clay	52	1.28	54.7
D-72	0-30	-	-	-	-	54	1.30	69.6
	30-60	-	-	-	-	54	1.28	68.7
D-79	0-30	-	-	-	-	74	1.26	70.7
								61.8