

17	93/12/05	Sun	Site No.6- Al-Mafod/ Ermah	-Survey -Al-Mafod/ Ermah to Ataq	-Site survey -Trip
18	93/12/06	Mon	Al-Mukalla	-Ataq to Al-Mukalla	-Trip
19	93/12/07	Tue	Site No.7- Al-Raidah/ Shamalya	-Meeting -Survey -Al-Mukalla	-NWSA/Al-Mukalla Branch -Site survey -Trip
20	93/12/08	Wef	Site No.7- Al-Raidah/ Shamalya	-Survey -Sayun	-Site survey -Trip
21	93/12/09	Thu	Site No.9- Al-Radood	-Courtesy call/ Meeting -Survey -Sayun	-Sayun Governor/ NWSA/Wadi Hadramout branch -Site survey -Trip
22	93/12/10	Fri	Site No.9- Al-Radood	-Survey -Sayun	-Site survey -Trip
23	93/12/11	Sat	Al-Mukalla	-Sayun to Al-Mukalla	-Trip
24	93/12/12	Sun	Site No.8- As Sadarah	-Al-Mukalla to As Sadarah -Survey	-Trip -Survey -(Team leader arrival in Sana'a)
25	93/12/13	Mon	Site No.8- As Sadarah	-Survey -As Sadarah to Al-Mukalla	-Site survey -Trip -(Team leader: Courtesy call to MPD and GAREW in Sana'a)
26	93/12/14	Tue	Aden	-Al-Mukalla to Aden	-Trip -(Team leader: Arrival in Aden)
27	93/12/15	Wed	Aden	-Meeting -Data analyze	-GAREW/Aden Branch -Data analyze
28	93/12/16	Thu	Site No.5- Gaishan	-Aden-Moodeyah -Moodeyah- Gaishan	-Trip -Moodeyah: re-survey
29	93/12/17	Fri	Site No.5- Gaishan	-Survey	-Site survey
30	93/12/18	Sat	Site No.5- Gaishan and Site No.2- Al-Faith/ Bani Baker	-Survey -Gaishan to Al-Faith/Bani baker	-Site survey -Trip

31	93/12/19	Sun	Site No.2- Al-Faith/ Bani Baker	-Survey	-Site survey
32	93/12/20	Mon	Site No.2- Al-Faith/ Bani Baker	-Survey	-Site survey
33	93/12/21	Tue	Site No.2- Al-Faith/ Bani Baker	-Survey -Al-Faith/ Bani Baker to Sana'a	-Site survey -Trip
34	93/12/22	Wed	Sana'a	-Meeting -Data analyze	-GAREW -Topographic and Geoelectrical survey data
35	93/12/23	Thu	Sana'a	-Meeting -Courtesy call -Data analyze	-GAREW -MEW and GAREW -Topographic and Geoelectrical survey data
36	93/12/24	Fri	Sana'a	-Data analyze	-Topographic and Geoelectrical survey data
37	93/12/25	Sat	Sana'a	-Meeting	-Signing of Minutes
38	93/12/26	Sun	Sana'a	-Sana'a to Paris	-Flight: AF276
39	93/12/27	Mon	Trip	-Paris to Tokyo	-Flight: AF8029
40	93/12/28	Tue	Tokyo	-Tokyo	

Appendix-I.c Member List of the Study Team

1) Basic Design Study Team

<u>Assignment</u>	<u>Name</u>	<u>Affiliation</u>
Team Leader	Dr. Yuji, MARUO	Senior Development Officer in Groundwater Development Japan International Cooperation Agency (JICA)
Water Supply Planner	Tetsuji, NIWANO	Japan Techno Co., Ltd.
Hydrogeologist	Akira, SATO	Japan Techno Co., Ltd.
Water Supply Planner	Naoki, TAIRA	Japan Techno Co., Ltd.
Facilities Designer	Yasuo, ONOZUKA	Japan Techno Co., Ltd.

2) Draft Final Mission Team

<u>Assignment</u>	<u>Name</u>	<u>Affiliation</u>
Team Leader	Kiyoto, KUROKAWA	First Basic Design Study Team Grant Aid Study & Design Dept. Japan International Cooperation Agency (JICA)
Project Manager	Tetsuji, NIWANO	Japan Techno Co., Ltd.
Water Supply Planner	Naoki, Taira	Japan Techno Co., Ltd.

Appendix I-d List of Persons Interviewed

1. Ministry of Planning and Development
 - 1) Mr. Abdul Wali Al-Agel, Deputy Minister
 - 2) Mr. Hisham Sharaf Abdalla, Director General of Dept. for Bilateral Economic Cooperation with Industrialized Countries
 - 3) Mr. Hamood Al-Hamadani, Director of Division of Bilateral Economic Cooperation with Industrialized Countries - Japan and USA

2. Ministry of Electricity and Water
 - 1) Mr. Ahmed Ali Al-Salamah, Minister

3. General Authority for Rural Electricity and Water
 - 1) Dr. Mohamoud A. Amin, Chairman
 - 2) Mr. Abdul Bari Saleh, Deputy Chairman(Water)
 - 3) Mr. Abdullah Abdul Malek, General Director(Water)
 - 4) Mr. Fawzy Al-Khirbash, Director of Bilateral Department
 - 5) Mr. Abdul Mumin Mutarh, Civil Engineer, Bilateral Department
 - 6) Mr. Hamud Gilan, Coordinator, Bilateral Department

4. General Authority for Rural Electricity and Water - Aden Branch
 - 1) Mr. Ali Salem Asker, General Manager
 - 2) Mr. Anwar Abdula Saleh Marfad, Chief of Study Section
 - 3) Mr. Mahmood Sultan Hassan, Hydrogeologist
 - 4) Mr. Ahmed Husin Gebel, Civil Engineer
 - 5) Mr. Walid Ali Othman, Hydrogeologist
 - 6) Mr. Waleed Ahmed Saeed, Civil Engineer

5. National Water and Sewage Authority - Aden Branch
 - 1) Mr. Khalid Bonami, Deputy Director
 - 2) Mr. Kaid A. Al-Derweesh, Mse. Hydrogeologist

6. National Water and Sewage Authority - Tor Al-Bah Branch
 - 1) Mr. Mohammed Saeed Saleh, Deputy Director

7. National Water and Sewage Authority - Al-Mukalla Branch
 - 1) Mr. Salem Hassan Barid, Deputy Director

8. National Water and Sewage Authority - Wadi Hadramout Branch
 - 1) Mr. Saeed Bashir, Deputy Director

9. Local Government Offices
 - 1) Lahj Governorate:
Mr. Mohammed Rashed Nasse, Deputy Governor
 - 2) Abyan Governorate:
Mr. Shihab Nasser, General Manager for Water and Electricity
 - 3) Ahwar Markaz:
Mr. Sahre Nasser Freed, General Manager for Water and Electricity
 - 4) Moodeyah Mudiriya:
Mr. Abdullar Saleh, General Manager for Water and Electricity
 - 5) Shabwa Governorate:
Mr. Shangor, General Manager for Water
 - 6) Ermah Mudiriya:
Mr. Ahmed Mubarak Laglaf, Mudir Mudiriya
 - 7) Sayun Mudiriya:
Mr. Awab Asabaya, Deputy Mudir Mudiriya
 - 8) Gaishan Markaz:
Mr. Ali Mohammed Hussein, Manager of Water Office
 - 9) Mani Maker Markaz:
Mr. Abo Baker Ahmed, Manager of Water Office

10. Embassy of Japan
 - 1) Mr. Susumu Akiyama, Ambassador Extraordinary and Plenipotentiary
(At the time of draft final mission)
 - 2) Mr. Kazuo Wanibuchi, Ambassador Extraordinary and Plenipotentiary
(At the time of basic design study)
 - 3) Mr. Mitsuru Murase, First Secretary
 - 4) Yasuo Nakano, First Secretary

11. Consular Office of Japan

Mr. Toru Kumada, Minister Counsellor

APPENDIX II

SOCIO-ECONOMIC BACKGROUND

Appendix II.a - Economic Indicators(1986-1992)

Economic Indicators	1988	1989	1990	1991 ^a	1992 ^a
GDP at current prices YR bn	62.1	65.1	81.2	112.6	170.8
Real GDP growth(%)	-	-	-3.0	-5.0	-2.1
Consumer price inflation(%)	10.6	15.2	34.2	45.0	55.0
Exports fob (US\$m)	519.0	693.0	626.0	530.0	573.0
Imports fob (US\$m)	1,969.0	1,875.0	1,671.0	1,600.0	1,520.0
Current account (US\$m)	-	-712.0 ^a	-216.0 ^a	-265.0	-584.0
Reserves excl. gold (US\$m)	365.0 ^c	356.0 ^c	250.0 ^a	220.0	180.0
Total external debt (US\$m)	5,139.0 ^d	5,496.0 ^d	6,518.0 ^d	6,735.0	6,845.0
Exchange rate(av) ^e YR:US\$	-	-	14.0	30.0	33.0 ^f

August 5, 1993/YR44.5:US\$1

Origins of GDP-1991	% of Total
Agriculture, forestry & fisheries	20.4
Manufacturing	20.2
Services	59.4
GDP at market prices	100.0

Components of GDP-1991	% of Total
Private consumption	78.2
Government consumption	25.8
Gross fixed investment	10.4
Change in stocks	0.3
Exports of goods & services	8.1
Imports of goods & services	-22.8
GDP at market prices	100.0

Principal exports-1991	US\$m
Mineral fuels & lubricants	457.0
Food, beverages and live animals	25.7
Raw materials	19.2

Principal imports-1991	US\$ cif
Food and beverages	593.0
Manufactured goods	407.8
Machinery & transport equipment	345.0
Mineral fuels & lubricants	329.6

Main Destinations of exports-1991	% of total
Italy	55.0
USA	32.0
Jordan	5.1
Saudi Arabia	1.4
UAE	1.1

Main origins of imports-1991	% of total
UAE	6.4
JAPAN	6.4
Saudi Arabia	6.0
Kuwait	5.7
USA	5.5

a : EIU estimates.

b : New series.

c : Actual aggregates from IMF source.

d : Actual aggregates from World Bank source.

e : Parallel market rate. Official rates following unification are
YR12:\$1 for staple commodities, YR18:\$1 for most other goods,
and YR25:\$1 for oil companies and tourists.

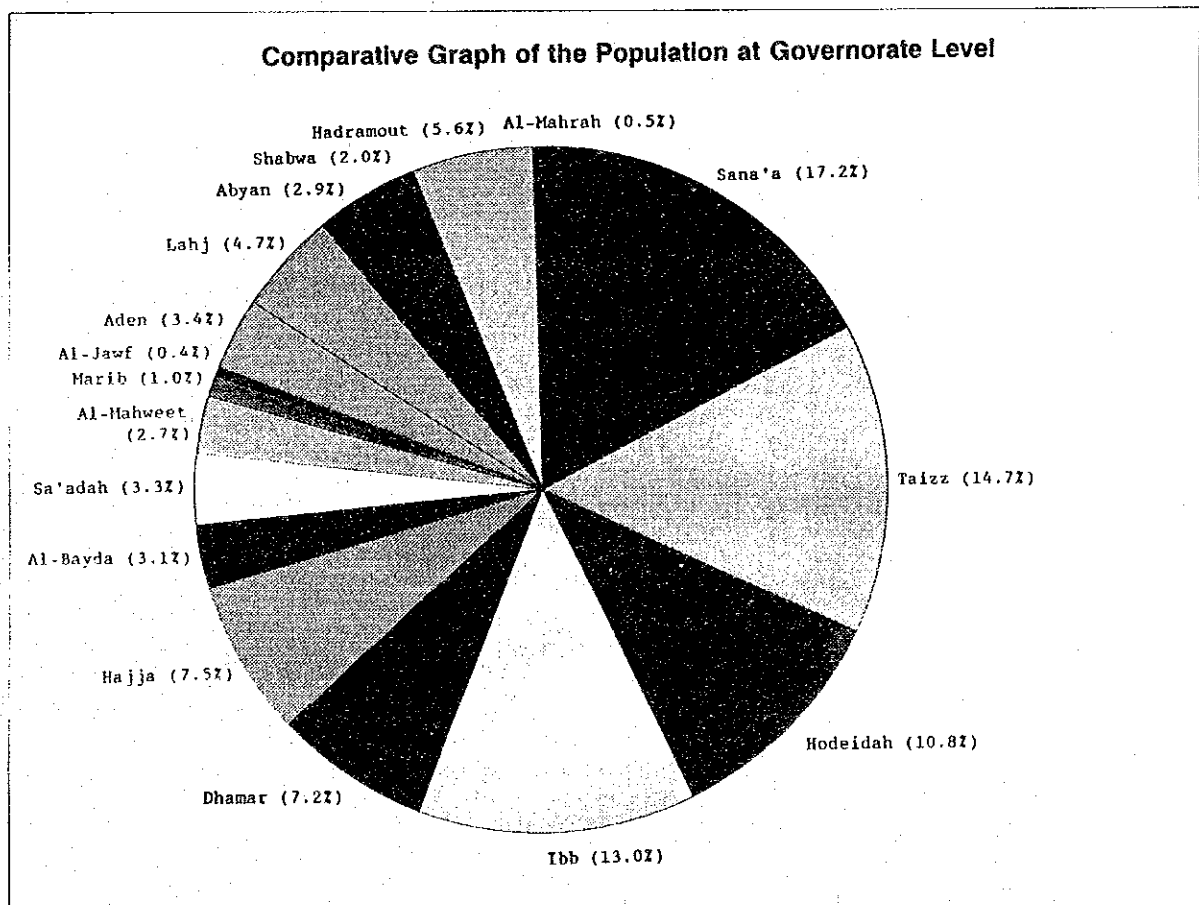
f : January 1-November 18 when trading halted.

Appendix-2.b Population of the Republic of Yemen at Governorate Level

Nothern part:Census of 1986 Southern Part:Census of 1988

	Governorate	Urban				Rural				Total (A)+(B)	
		Male	Female	Total (A)	(%)	Male	Female	Total (B)	(%)		
Nothern Part	1)Sana'a	255,260	207,343	462,603	27.79	583,187	618,746	1,201,933	72.21	1,664,536	100.0%
	2)Taizz	106,144	87,790	193,934	13.66	567,938	657,836	1,225,774	86.34	1,419,708	100.0%
	3)Hodeidah	149,981	137,871	287,852	27.48	371,409	388,285	759,694	72.52	1,047,546	100.0%
	4)Ibb	55,626	47,703	103,329	8.24	545,928	604,871	1,150,799	91.76	1,254,128	100.0%
	5)Dhamar	27,942	24,268	52,210	7.47	308,384	338,229	646,613	92.53	698,823	100.0%
	6)hajja	15,513	12,796	28,309	3.93	344,317	347,374	691,691	96.07	720,000	100.0%
	7)Al-Bayda	17,685	17,207	34,892	11.81	123,118	137,429	260,547	88.19	295,439	100.0%
	8)Sa'adah	15,065	11,257	26,322	8.15	147,054	149,747	296,801	91.85	323,123	100.0%
	9)Al-Mahweet	6,089	5,498	11,587	4.44	121,812	127,437	249,249	95.56	260,836	100.0%
	10)Marib	3,375	2,059	5,434	5.70	45,622	44,270	89,892	94.30	95,326	100.0%
	11)Al-Jawf	653	692	1,345	3.15	20,897	20,520	41,417	96.85	42,762	100.0%
Southern Part	1)Aden	149,957	144,473	294,430	90.06	16,473	16,016	32,489	9.94	326,919	100.0%
	2)Lahj	15,161	15,172	30,333	6.62	208,519	219,533	428,052	93.38	458,385	100.0%
	3)Abyan	20,250	20,943	41,193	14.75	113,480	124,568	238,048	85.25	279,241	100.0%
	4)Shabwa	11,770	12,508	24,278	12.59	77,636	90,910	168,546	87.41	192,824	100.0%
	5)Hadramout	83,804	89,718	173,522	32.31	169,912	193,661	363,573	67.69	537,095	100.0%
	6)Al-Mahrah	9,178	8,587	17,765	40.17	12,993	13,467	26,460	59.83	44,225	100.0%
Total		943,453	845,885	1,789,338	18.52	3,778,679	4,092,899	7,871,578	81.48	9,660,916	100.0%

DATA Source:Ministry of Planning & Develoment, Statistical Year Book 1992 .



Appendix-2.c Record of Official Development Assistance.

	1986	1987	1988	1989	1990	1991
Bilateral	262.1	360.6	244.3	285.1	352.1	245.4
ARAB COUNTRIES	141.4	192.2	66.5	80.1	172.0	13.7
JAPAN	15.9	27.7	29.1	72.2	23.0	105.3
NETHERLANDS	22.8	28.5	35.0	30.9	30.4	25.3
GERMANY	15.5	32.4	33.1	27.4	38.0	23.5
USA	40.0	45.0	27.0	40.0	43.0	21.0
DENMARK	3.0	8.6	16.3	12.7	13.2	12.9
U.K.	6.9	10.4	12.6	10.6	9.9	9.3
Multilateral	122.1	131.7	134.4	150.8	123.2	119.9
WORLD BANK	46.6	40.4	49.0	43.0	33.0	49.0
ARAB AGENCIES	36.1	43.6	38.8	42.6	29.0	24.2
WFP	14.7	18.5	19.3	27.0	21.0	15.1
UNDP	6.1	4.9	9.3	14.6	17.2	13.5
Total	384.2	492.3	378.7	435.9	475.4	364.7

DATA Source : Economic Intelligence Unit Country Profile 1993/94

Appendix II-d. Record of Japanese Financial Assistance to the Republic of Yemen (1976 - 1992)

Actual results by year and type of aid

Unit = 100 million yen

YEAR	LOAN AID		GRANT AID	
	PROJECT NAME	AMOUNT	PROJECT NAME	AMOUNT
1976	Rural Water Supply Project	38.80	Food Aid	4.00
1977	—	—	Food Aid	6.22
			Fishery Training Boat	4.50
1978	—	—	Food Aid	5.85
1979	Las Katib Thermoelectric Power Plant	82.00	Aid for Increased Food Production	5.00
			Debt Relief	0.05
1980	—	—	Debt Relief	0.16
1981	—	—	Rural Water Supply Project I	5.00
			Food Aid	2.78
			Debt Relief	0.25
1982	Construction Project for the 7th berth of Hodeidah Port	82.00	Rural Water Supply Project II	5.00
			Aid for Increased Food Production	5.00
			Debt Relief	0.66
			Disaster Relief (for earthquake)	1.17
			Study Equipment for Sana'a University	0.45
			Disaster Relief (for flood)	0.57
1983	—	—	Rural Water Supply Project III	6.00
			Reconstruction Project for Earthquake Disaster	8.00
			Aid for Increased Food Production	5.00
			Debt Relief	0.84
			Food Aid	1.41
1984	—	—	Expansion of the National Tuberculosis Center I	9.18
			Reconstruction Project for Earthquake Disaster	2.50
			Aid for Increased Food Production	6.00
			Debt Relief	0.47
1985	—	—	Expansion of the National Tuberculosis Center II	10.80
			Aid for Increased Food Production	5.00
			Debt Relief	1.55
			Scanning Electron Microscope for Sana'a Univ.	0.41
			Fisheries Culturing Research Center	9.41

YEAR	LOAN AID		GRANT AID	
	PROJECT NAME	AMOUNT	PROJECT NAME	AMOUNT
1986	--	--	Rural Water Supply ProjectIV Aid for Increased Food Production	3.19 5.00
			Debt Relief	1.06
1987	Project for Construction of Facilities for Circulating of Petroleum Products	115.30	Rural Water Supply ProjectV Aid for Increased Food Production	9.15 5.00
			Debt Relief	2.00
1988	Construction Project for the Mafrag Cement Factory	220.70	Rural Water Supply ProjectVI Aid for Increased Food Production	9.61 4.00
			Debt Relief	2.90
			Rehabilitation project for Fishery Training Boat	1.95
1989	Aden City Telecommunication Network Expansion Project	69.69	Rural Telecommunication Network Expansion Project I Aid for Increased Food Production	5.40 2.50
			Debt Relief	1.72
			Debt Relief	2.86
			Equipment for Producing Educational and Cultural Programs to the National Television Corporation	0.47
			Small-Scale Grant Aid	0.11
			Disaster Relief (for flood)	0.14
			Aid for Increased Food Production	2.00
1990	--	--	Rural Telecommunication Network Expansion ProjectII Aid for Increased Food Production	6.63 5.00
			Debt Relief	6.23
			Debt Relief	3.46
			Small-Scale Grant Aid	0.11
1991	--	--	Project for Expansion of National Tuberculosis Contorol Program	5.08
			Rural Water Supply Project (1/3)	5.87
			Aid for Increased Food Production	5.00
			Debt Relief	9.19
			Debt Relief	4.74
			Audio-Visual equipment to the Sana'a Culture Center	0.41
			Small-Scale Grant Aid	0.14

YEAR	LOAN AID		GRANT AID	
	PROJECT NAME	AMOUNT	PROJECT NAME	AMOUNT
1992	-	--	Rural Water Supply Project (2/3)	5.31
			Project for the Establishment of the Workshop for Road Construction	10.35
			Aid for Increased Food Production	5.00
			Disaster Relief (for flood)	0.19
			The supply of equipment to be used for the preservation and restoration of cultural assets to the General Organization for the the Preservation of Historic Cities	0.43
			Debt Relief	4.70
			Debt Relief	1.72
			Small-Scale Grant Aid	0.17
	Total (1976-1992)	608.49	Total (1976-1992)	252.02

Appendix II-e List of major Disease Case-load (1)

GOVERNORATE	Enteritis And Other Diarrhoeal Diseases	Pneumonia	Leishmania	Shistosoma	Syphilis	Gonorrhea	Leprosy	Rabies	Puerperals	Tetanus	Tuberculo- sis	Influenza
SANA'A	-	44,260	34	9,135	26	1	-	-	-	1,066	7,950	-
TAIZ	-	30,718	313	4,290	39	8	4	-	-	129	2,513	-
HODEIDAH	-	2,854	12	28	114	73	3	-	-	34	180	-
IBB	-	7,091	7	1,708	2	-	-	-	-	2,217	1,788	-
DHAMAR	-	17,350	11	1,135	3	-	1	-	-	256	1,659	-
HAJJAH	-	4,047	-	1,499	-	82	13	-	-	27	368	-
AL-BAYDA	-	2,537	-	19	-	-	-	-	-	-	25	-
SA'ADAH	-	9,377	1	1,099	70	2	-	-	-	38	336	-
AL-MAHWEET	-	4,061	10	300	-	-	-	-	-	98	339	-
MARIB	-	13,437	-	507	-	-	-	-	-	56	1,897	-
AL-JAWF	-	-	2	-	-	-	1	-	-	-	-	-
ADEN	15,021	17,793	-	175	8	28	-	-	-	22	3,911	19,948
LAHJ	69,468	7,452	-	2,029	-	-	-	-	-	-	2,019	11,318
ABYAN	11,840	366	-	76	-	-	-	-	-	-	1,288	503
SHABWAH	28,979	4,993	-	515	-	7	5	-	26	-	1,919	9,905
HADRAMOUT	-	-	-	-	-	-	-	-	-	-	-	-
AL-MAHRAH	1,254	202	-	-	-	-	-	-	-	-	353	3,915

DATA SOURCE: Ministry of Planning & Development, "Statistical Year Book 1990".

Appendix II-e List of major Disease Caseload (2)

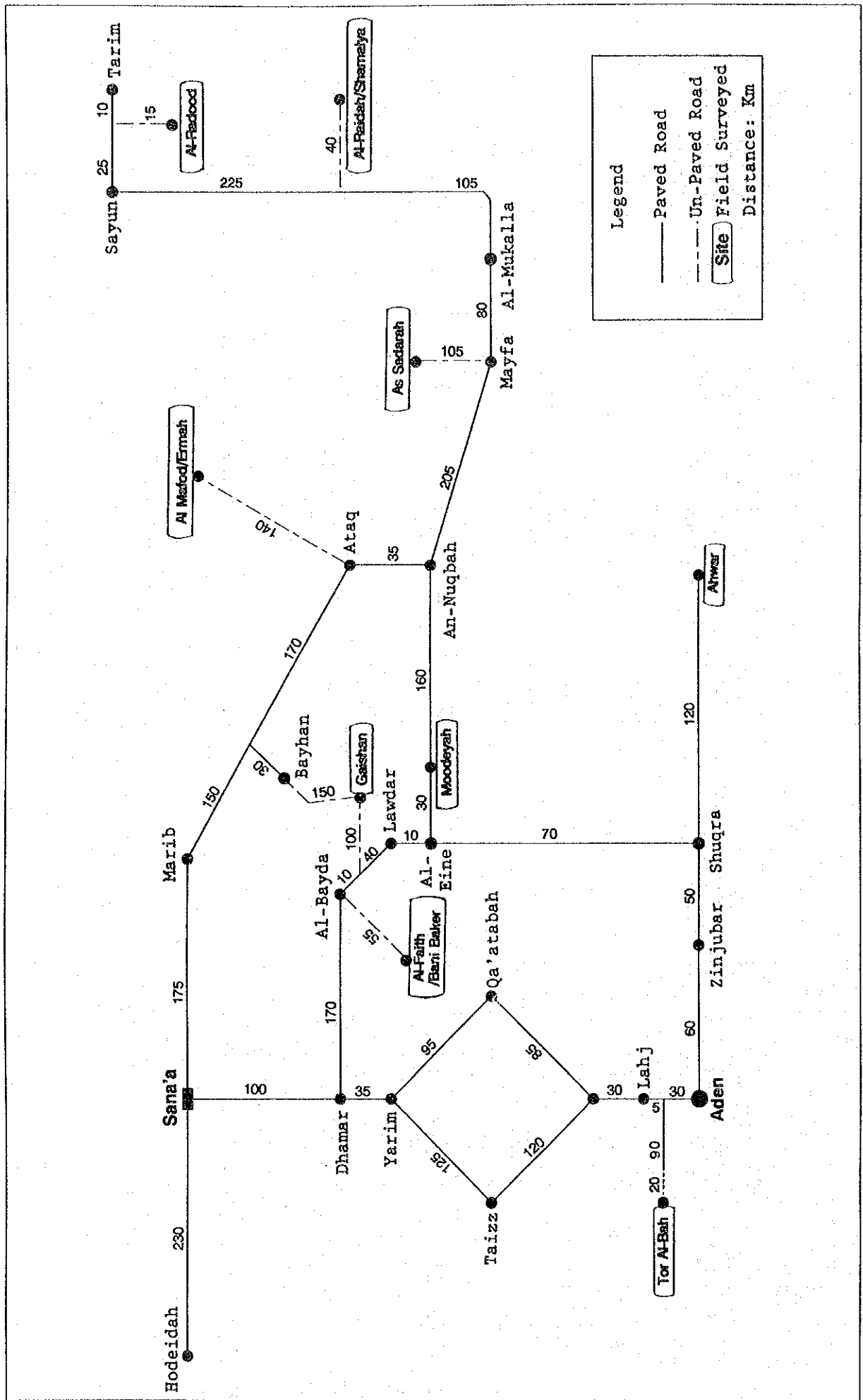
GOVERNORATE	Malaria	Menin- gitis	Diphthe- ris	Poliomye- litis	Chicken Pox	Measles	Scarlet Fever	Whooping Cough	Enteri- tis	Amebic Dysen- tery	Infection H. Patient s	Mumpes	Typhoid & Par. Typhoid
SANA'A	18,635	-	1,791	897	-	7,597	-	4,143	20,279	-	4,671	7,470	-
TAIZ	26,076	-	259	294	-	3,142	-	2,003	25,758	-	3,029	882	-
HODEIDAH	3,896	-	3	27	-	68	-	67	3,386	-	281	265	-
IBB	6,470	-	79	76	-	3,143	-	1,109	17,908	-	1,174	1,162	-
DHAMAR	13,384	-	284	322	-	1,426	-	1,146	13,905	-	1,637	1,038	-
HAAJAH	5,872	-	156	163	-	159	-	229	2,122	-	1,182	1,151	-
AL-BAYDA	625	-	-	3	-	897	-	230	4,072	-	179	393	-
SA'ADAH	3,049	-	26	39	-	159	-	183	2,437	-	538	718	-
AL-MARWET	3,151	-	102	37	-	356	-	165	3,851	-	343	523	-
MARIB	4,851	-	129	43	-	2,188	-	1,148	13,365	-	945	424	-
AL-JAWF	-	-	-	-	-	-	-	-	-	-	-	-	-
ADEN	7,664	135	2	2	17	1,002	-	60	28,759	5,402	582	-	24
LAHJ	41,247	11	-	15	-	653	-	607	46,522	14,610	705	-	1
ABYAN	5,266	-	-	-	-	592	-	405	11,233	8	-	-	-
SHAWAH	16,465	27	1	61	121	2,218	-	828	30,438	6,228	64	-	1
HADRAMOUT	-	-	-	-	-	-	-	-	-	-	-	-	-
AL-MAHRAH	13	-	-	2	-	-	-	-	4,280	3	3	-	-

DATA SOURCE: Ministry of Planning & Development, "Statistical Year Book 1990".

Appendix-II.f Project Site Data

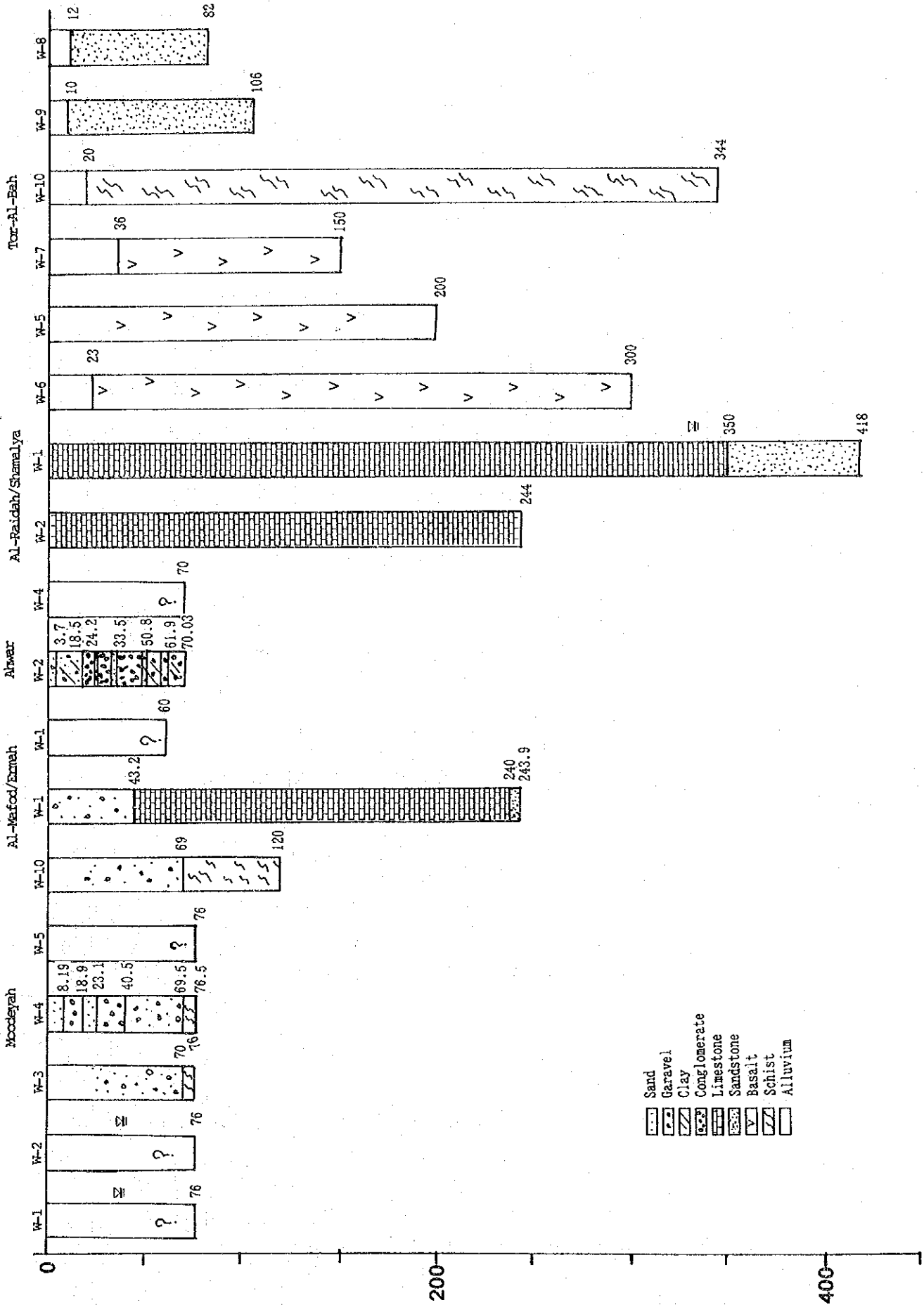
Site Name	Village Name	Household Number	Population (1993)	Population (2003)	Population (2008)	Annual Rate of Increase
Tor Al-Bah	Wadi Shaap	800	6,000	7,314	8,075	2.00%
	Tor Al-Bah	1,000	8,000	10,341	11,757	2.60%
	Wahdat Al-Wahsh	600	3,000	3,657	4,038	2.00%
	Wahdat Al-Kebssi	650	3,500	4,266	4,711	2.00%
	Wahdat Al-Doseri	500	2,500	3,047	3,365	2.00%
	Wahdat M.A. Mockbil	700	5,000	6,095	6,729	2.00%
	Wahdat Nagib	1,000	9,000	10,971	12,113	2.00%
	Wadi Tukar	600	4,000	4,876	5,383	2.00%
	Al-Maamieah	800	6,000	7,314	8,075	2.00%
	Al-Sammietah	1,100	8,500	10,361	11,440	2.00%
	Keriat Alkadi & Alfershah	800	6,000	7,314	8,075	2.00%
	Alfershah	800	7,000	8,533	9,421	2.00%
	Al-Mockholia & Al-Nowieam	800	7,500	9,142	10,094	2.00%
	Haieh	500	2,800	3,413	3,768	2.00%
		Total	10,650	78,800	96,646	107,045
Moodeyah	Moodeyah	2,000	14,500	18,743	21,310	2.60%
	Al-Magbabh	600	4,500	5,485	6,056	2.00%
	Gezt Hageh	50	500	609	673	2.00%
	Karn Achal	150	1,500	1,828	2,019	2.00%
	Karn Marm	15	100	122	135	2.00%
	Gibrat Uzura	500	3,500	4,266	4,711	2.00%
	Gariet Aurmh	450	2,500	3,047	3,365	2.00%
	Gariet Paran	17	220	268	296	2.00%
	Am Hafhaf	25	300	366	404	2.00%
	Al-Madarh	50	1,000	1,219	1,346	2.00%
	Zyoar	20	500	609	673	2.00%
	Al-Qrih	15	500	609	673	2.00%
	Al-Qurath	300	2,000	2,438	2,692	2.00%
	Al-Quz	250	2,900	3,535	3,903	2.00%
	Thouba	100	600	731	808	2.00%
	Kua Al-Asel	50	400	488	538	2.00%
	Al-Kaser	50	500	609	673	2.00%
	Al-Awadi	20	500	609	673	2.00%
	Gaman	30	300	366	404	2.00%
	Al-Hussain	20	200	244	269	2.00%
Al-Musibh	5	100	122	135	2.00%	
	Total	4,717	37,120	46,317	51,753	2.24%
Gaishan	Wassar	100	1,100	1,341	1,480	2.00%
	Center Gaishan	20	200	244	269	2.00%
	Al-Awaseg	30	300	366	404	2.00%
	Al-Moheerh	20	220	268	296	2.00%
	Ajwa	10	120	146	162	2.00%
	Al-Hosyn	5	60	73	81	2.00%
	Al-Marwah	7	70	85	94	2.00%
	Am Garyf	7	50	61	67	2.00%
	Shaib Amsharia	8	70	85	94	2.00%
	Al-Hatos Alaa	15	150	183	202	2.00%
	Al-Hatos Asfal	15	150	183	202	2.00%
	Maleha	40	400	488	538	2.00%
	Khadsh	10	100	122	135	2.00%
	Ambatira	20	200	244	269	2.00%
	Massian	80	800	975	1,077	2.00%
	Amsalif	5	50	61	67	2.00%
	Shaib-Shwal	5	50	61	67	2.00%
	Hwsan	12	120	146	162	2.00%
	Damrasah	3	20	24	27	2.00%
	Assalf	5	50	61	67	2.00%
	Amtyam	12	70	85	94	2.00%
	Dumra	5	50	61	67	2.00%
	Jharbt-Atef	5	50	61	67	2.00%
	Al-Marabbia	7	40	49	54	2.00%
		Total	446	4,490	5,473	6,043

Site Name	Village Name	Household Number	Population 1993	Population 2003	Population 2008	Annual Rate of Increase
Al-Mafod/ Ermah	Al-Mafod	800	2,500	3,047	3,365	2.00%
	Al-Hoson	40	250	305	336	2.00%
	Al-Hosaha	50	300	366	404	2.00%
	Al-Kowecra	35	320	390	431	2.00%
	Al-Kocra	30	200	244	269	2.00%
	Al-Hoobyt	40	400	488	538	2.00%
	Ba Killa	250	2,000	2,438	2,692	2.00%
	Al-Qarh	60	600	731	808	2.00%
	Al-Hura	55	500	609	673	2.00%
	Al-Jeeza	25	250	305	336	2.00%
	Qart Pinzayd	10	150	183	202	2.00%
	Al-Khleef	15	130	158	175	2.00%
	Al-Jwelpinmareef	35	350	427	471	2.00%
	Al-Gasira	14	120	146	162	2.00%
Al-Talluha	40	400	488	538	2.00%	
	Total	1,499	8,470	10,325	11,400	2.00%
Ahwar	Al-Jawal	15	75	91	101	2.00%
	Shrateen	22	154	188	207	2.00%
	Al-Subel	30	300	366	404	2.00%
	Joul Hil	75	1,300	1,585	1,750	2.00%
	Al-Garieb	25	800	975	1,077	2.00%
	Ahwar	400	7,000	9,048	10,287	2.60%
	Al-Shaga	65	1,000	1,219	1,346	2.00%
	Al-Bander	45	800	975	1,077	2.00%
	Al-Sani	120	2,000	2,438	2,692	2.00%
	Al-Ramis	40	500	609	673	2.00%
	Al-Rawad	170	4,000	4,876	5,383	2.00%
	Al-Goul	200	2,500	3,047	3,365	2.00%
	Husen Moh'd	50	400	488	538	2.00%
	Hanad	350	7,500	9,142	10,094	2.00%
	Ambusty	10	200	244	269	2.00%
Hay Badeed	250	3,800	4,912	5,585	2.60%	
Al-Sharwa	60	700	905	1,029	2.60%	
	Total	1,927	33,029	41,109	45,876	2.21%
Al-Radood	Al-Radood		5,000	6,463	7,348	2.60%
	Sonah		300	366	404	2.00%
	Lanzula		320	390	431	2.00%
	Al-Mudaimena		50	61	67	2.00%
	Al-Gawi		180	219	242	2.00%
	Al-Tahih		250	305	336	2.00%
	Al-Muarroof		300	366	404	2.00%
	Al-Husn		850	1,036	1,144	2.00%
	Al-Mhewad		40	49	54	2.00%
	Al-Sharqa		240	293	323	2.00%
	Rateeh		850	1,036	1,144	2.00%
Shuriuof		600	731	808	2.00%	
	Total	0	8,980	11,315	12,705	2.34%
Al-Faith/ Bani Baker	Bani Baker		12,000	14,628	16,150	2.00%
	Al-Faith		4,000	4,876	5,383	2.00%
	Kholagah		8,000	9,752	10,767	2.00%
	Al-Firdah		4,000	4,876	5,383	2.00%
	Total	0	28,000	34,132	37,684	2.00%
Al-Raidah/ Shamalya	Al-Sufilah	350	5,000	6,095	6,729	2.00%
	Al-Assdef	8	100	122	135	2.00%
	Al-Rahbah	200	2,000	2,438	2,692	2.00%
	Al-Ka'a	100	1,000	1,219	1,346	2.00%
	Al-Oygar	5	50	61	67	2.00%
	Al-Asaeb	100	800	975	1,077	2.00%
	Al-Nuwaidara	50	500	609	673	2.00%
	Total	813	9,450	11,519	12,718	2.00%
As Sadarah	As Sadara	755	4,600	5,607	6,191	2.00%
	Thilone	15	150	183	202	2.00%
	Hosn Basilaman	300	2,500	3,047	3,365	2.00%
	Al-Kchah	350	3,000	3,657	4,038	2.00%
	Asanned-wa Al-Garih	20	200	244	269	2.00%
	Bamesiblin	30	350	427	471	2.00%
	Al-Harjah	15	250	305	336	2.00%
	Total	1,485	11,050	13,470	14,872	2.00%



Appendix-II.g Road Condition and Distances to the Project Sites

APPENDIX III
WATER SOURCES



APPENDIX III - a Lithology of Boreholes in the Project Sites

APPENDIX III - b Geoelectric Prospecting Data

During the field survey, the geoelectric prospecting was carried out. The results are shown as follows:

1. Outline of the survey

A.) Equipment: Type MCOHM Specific Earth Resistance Tester

B.) Prospecting points and depth

Site name	Number of prospecting points	Measuring Depth(m)
TOR AL BAH	3	100 - 120
AHWAR	4	100
AL-MAFOD/ERMA	1	80
AL-RADOOD	1	100

C.) Measuring method: Wenner's 4-electrode configuration

Electrode separation:

1 m	interval 0-4 m
2 m	interval 4-32 m
4 m	interval 32-100 m
10 m	interval 100m -

Analysis: Sundberg's standard curve method combined with direct reading method

2. Results of prospecting

(1) Tor Al-Bah

Survey Point	T-1(W-2)		T-2(W-5)		T-3(W-4)	
Formation Group	Depth(m)	Resistivity value($\Omega \cdot m$)	Depth(m)	Resistivity value($\Omega \cdot m$)	Depth(m)	Resistivity value($\Omega \cdot m$)
Alluvium	0 - 0.9	300	0 - 0.9	340	0 - 0.82	18
	0.9-3.0	200	0.9 - 2	227	0.82-2.0	9
	3 - 8.0	420	2 - 4	450	2.0-22	72
	8.0- 24	48	4 - 10	110		
Quaternary volcanic rocks	24 - 60	12				
	60 - 72	52				
	72 - 80	3				
	80 -	70				
Tawilah Group			10-40			
			40-56			
			56-64			
			64-80			
			80-			
Precambrian					22 -	120

According to the analysis, it is not found from resistivity value relationship between resistivity value and range of salinity because geological structure is different each survey point. The groundwater is determined to be high salinity.

(2) Ahwar

Survey Point	A-1(W-1)		A-2	
Formation Group	Depth(m)	Resistivity value($\Omega \cdot m$)	Depth(m)	Resistivity value($\Omega \cdot m$)
Alluvium			0 - 1	163
			1 - 6	16
Terrance deposit	0 - 1	190	6 - 26	?
	1 - 6	21		
	6 - 24	216		
Pleistocene -Pliocene	24 - 48	42	26-40	168
			40-52	110
Miocene - Oligocene			52 -	6

Survey Point	A-3(W-2)		A-4(W-4)	
Formation Group	Depth(m)	Resistivity value($\Omega \cdot m$)	Depth(m)	Resistivity value($\Omega \cdot m$)
Alluvium	0 - 1.1	27	0 - 0.8	210
	1.1- 4.0	41	0.8 - 4	21
Terrance deposit	4 - 20	142	4 - 8	72
			8 - 24	140
Pleistocene -Pliocene	20 - 23	84	24-56	96
	23 - 32	120		
	32 - 40	92		
	40 - 52	80		
Miocene - Oligocene	52-	7	56 -	8

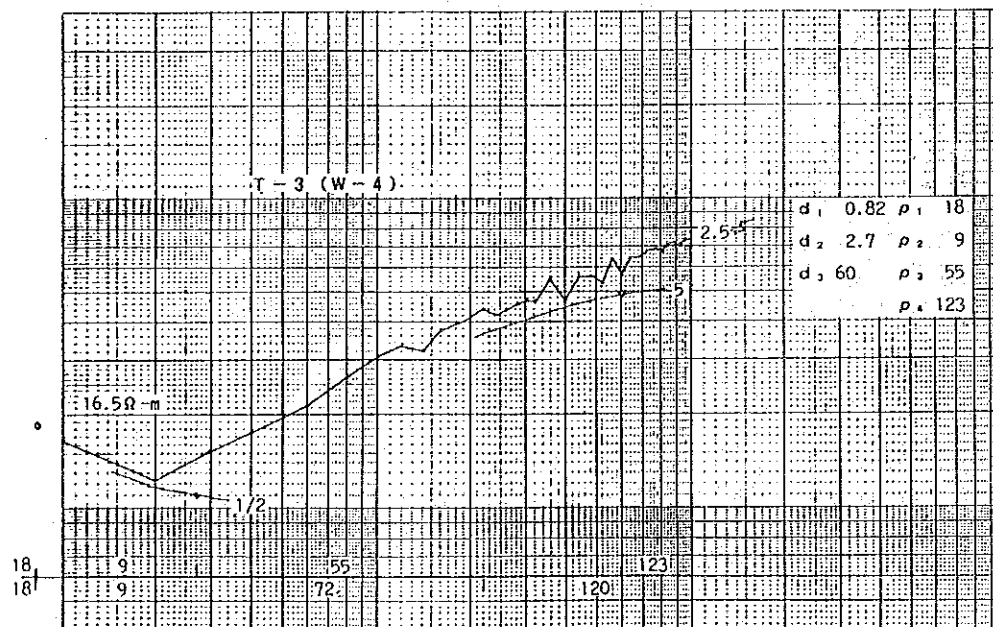
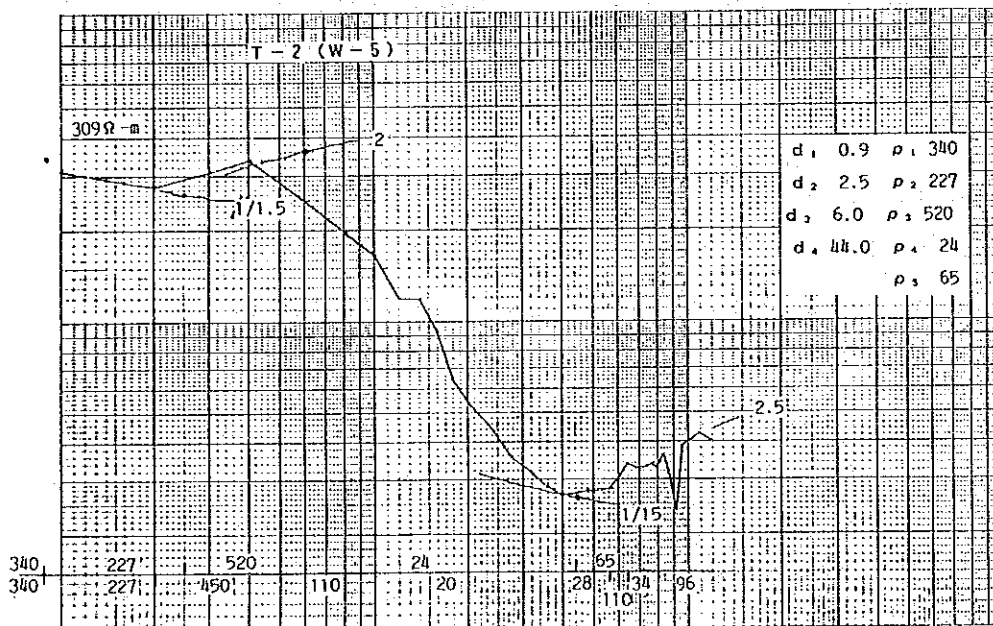
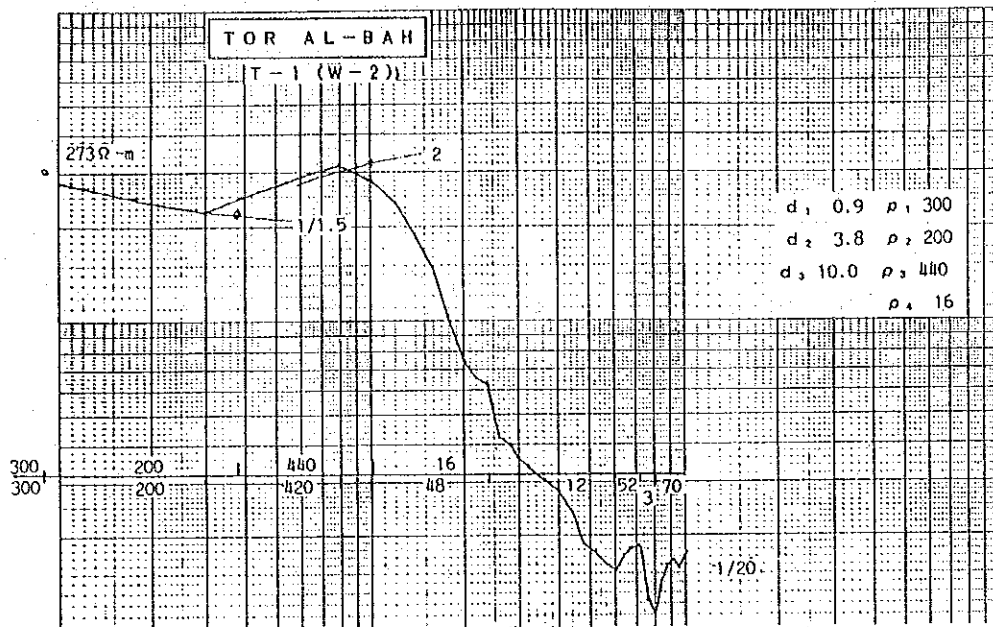
The data of Russinan well(No.1) shows that aquifer is Pleistocene - Pliocene series. Pleistocene - Pliocene series is indicated 90 -160 ($\Omega \cdot m$) at A-2, A-3, A-4, but it is low(42 $\Omega \cdot m$) at A-1, these result shows the groundwater become high salinity. Miocene - Oligocene series is predominately clay which is impermeable layer.

(3) Al-Mafot/Ermah

The measurement was not carried out at 80 m, because of dry condition. According to the data of existing well No. 1, S.W.L. is 125m, the measurement was not reached at the groundwater level in this area. Alluvium thickness is 40 m from ground, and below 40 m is limestone of Ummer-Rudhuma group.

(4) Al-Radood

Sand and gravel are alluvium, 10 m depth from ground, brecciated limestone (Umm Er-Rudhuma group) exist 10 to 52 m, and compact limestone (Umm Er-Rudhuma group) from 52 m. Aquifer is brecciated limestone layer at 10 m to 52 m.



AHWAR

A - 1

173Ω-m

d_1	1	ρ_1	190
d_2	7	ρ_2	21
d_3	32	ρ_3	230
		ρ_4	38

190	21	230	42	38	8
190	21	216	42	38	8

A - 2

163Ω-m

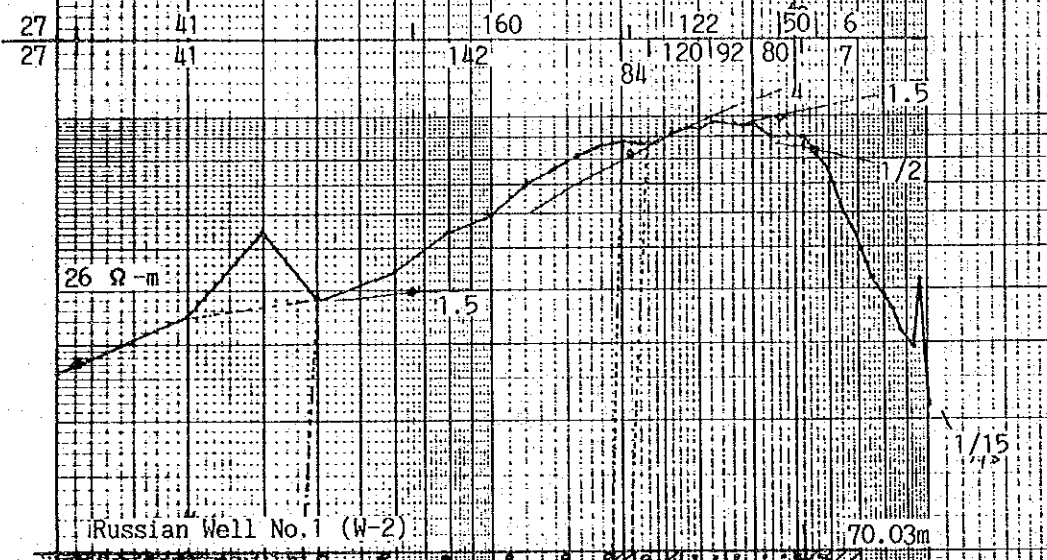
d_1	1	ρ_1	163
d_2	7	ρ_2	16
d_3	56	ρ_3	175
		ρ_4	6

163	16	175	110	6	6
163	16	168	110	6	6

A H W A R

d_1	1.1	ρ_1	27
d_2	6.6	ρ_2	41
d_3	21	ρ_3	160
d_4	46	ρ_4	122
d_5	56	ρ_5	50
		ρ_6	6

A - 3



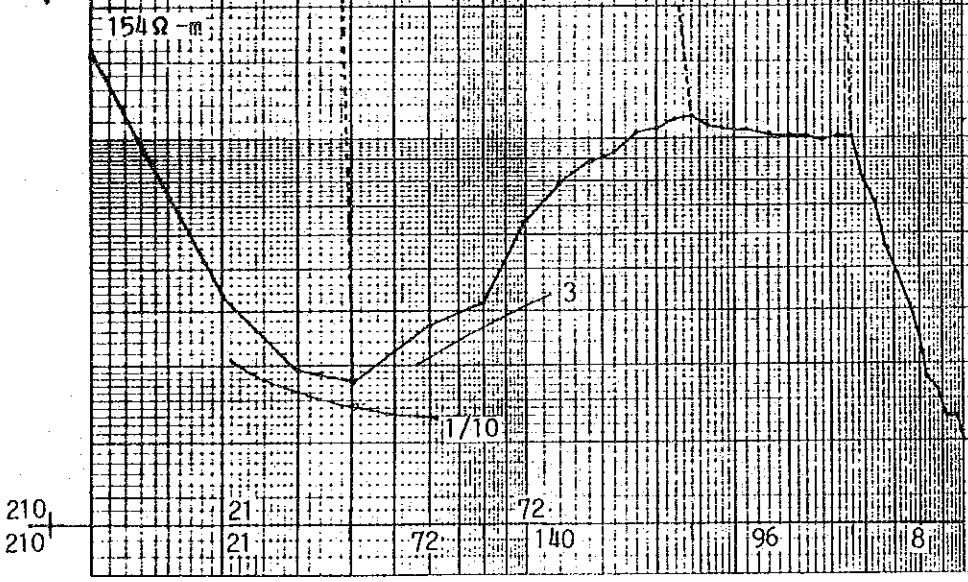
Russian Well No. 1 (W-2)

70.03m

← Early Quaternary ~ Pliocene | Oligocene ~ Miocene

A - 4

d_1	0.8	ρ_1	210
d_2	4	ρ_2	21
		ρ_3	72



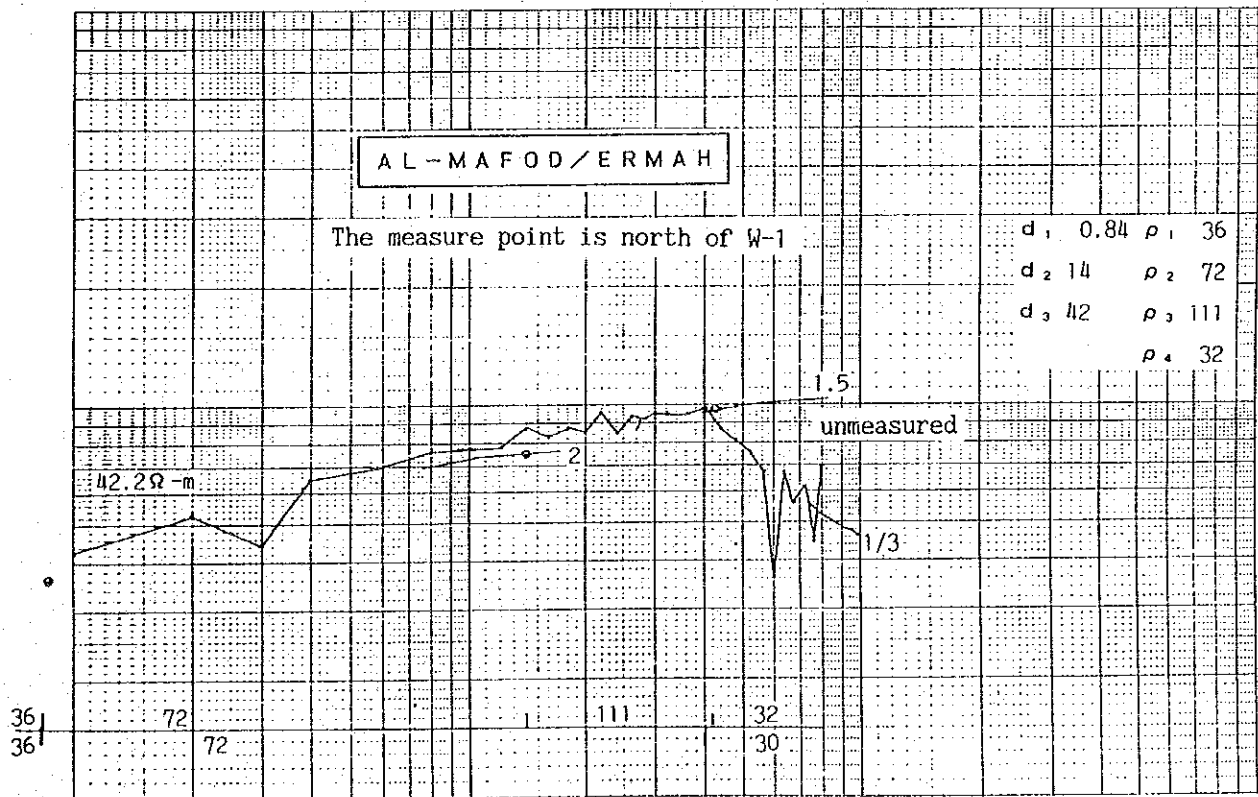
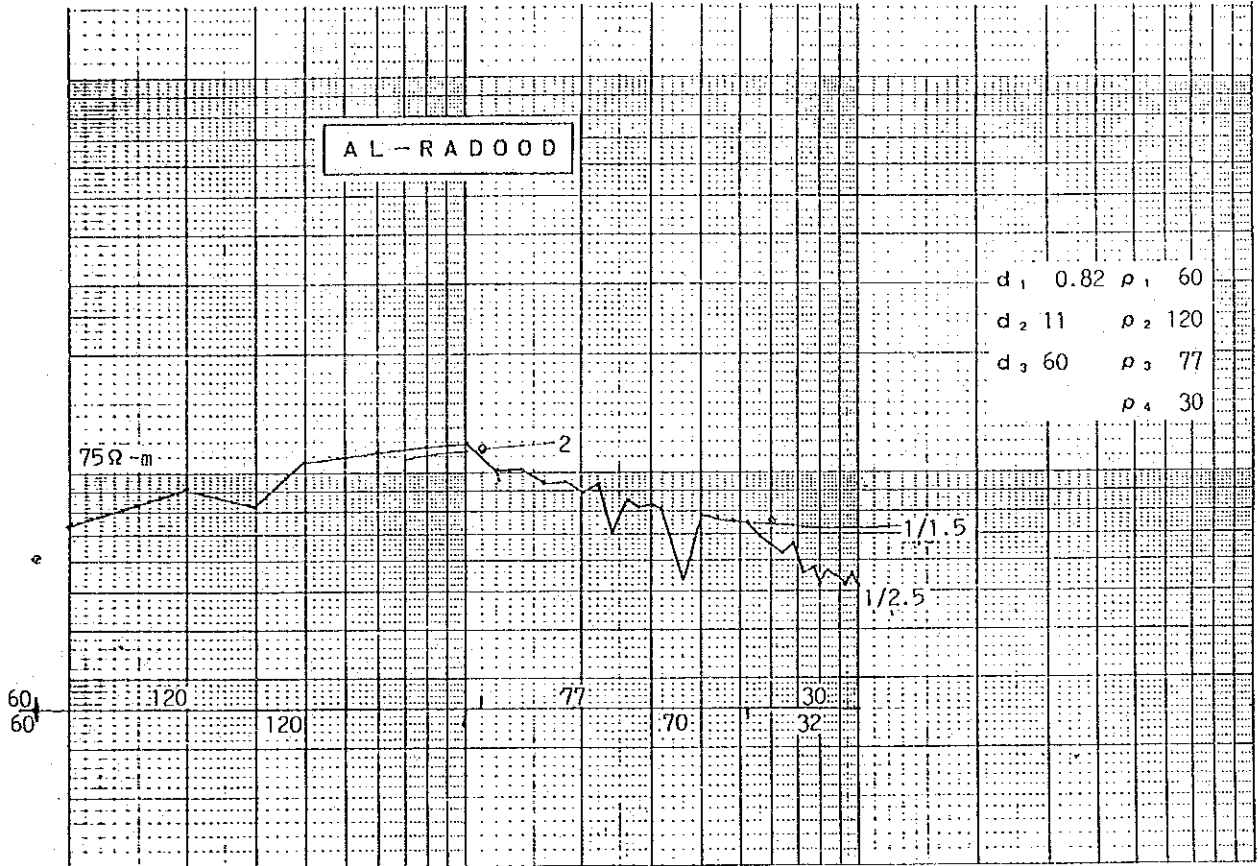
154 Ω-m

1/10

3

210
210

21 21 72 72 140 96 18

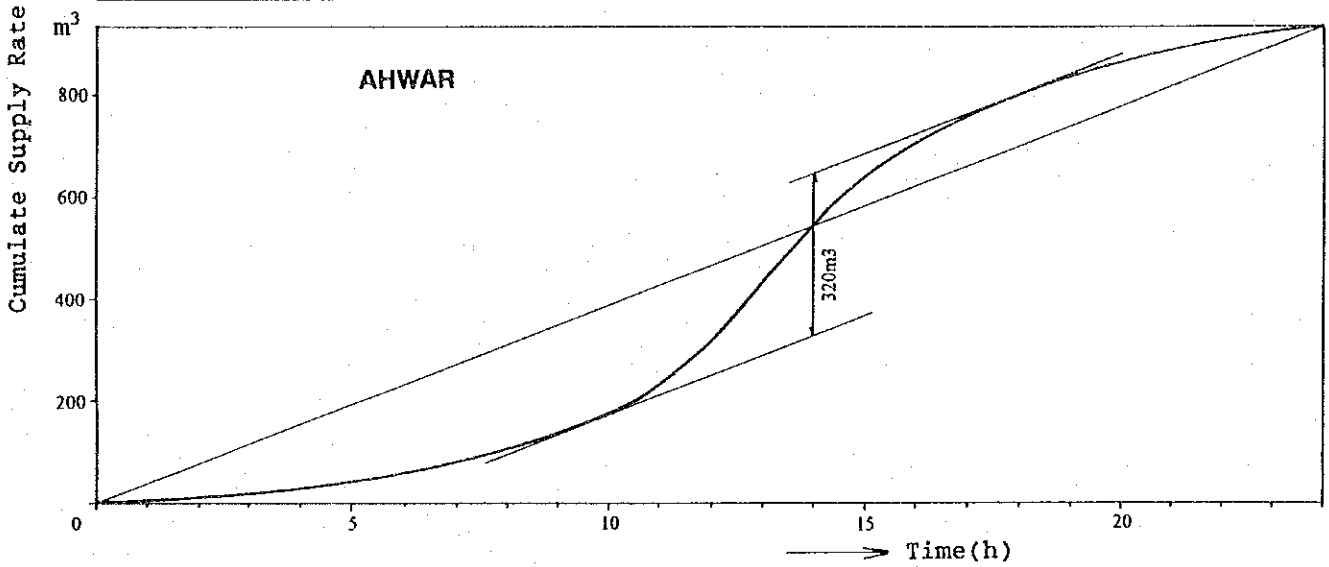


APPENDIX IV

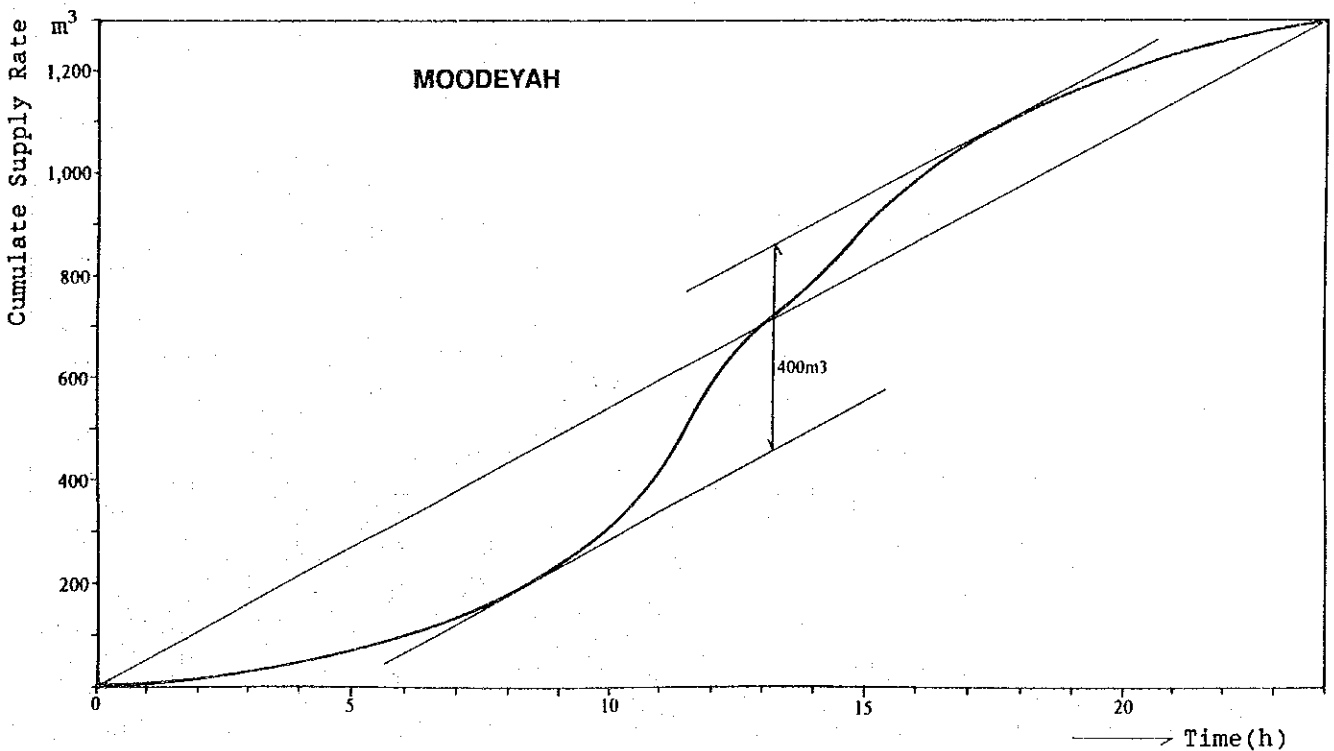
WATER SUPPLY FACILITIES

Appendix-IV.a Graphical Analysis of the Distribution Tank Capacity (1)

Site Name		AHWAR
Population(2008)		19,323
Supply Rate		50 l/cap/day
Tank Capacity	Calculated	320m ³
	Projected	100m ³ , 250m ³

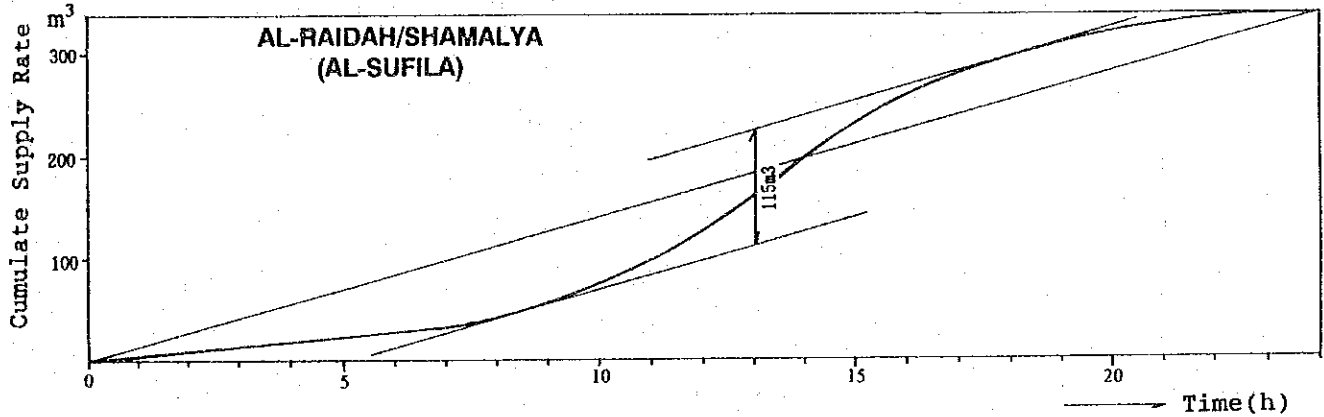


Site Name		MOODEYAH
Population(2008)		31,924
Supply Rate		40 l/cap/day
Tank Capacity	Calculated	400m ³
	Projected	100m ³ , 300m ³

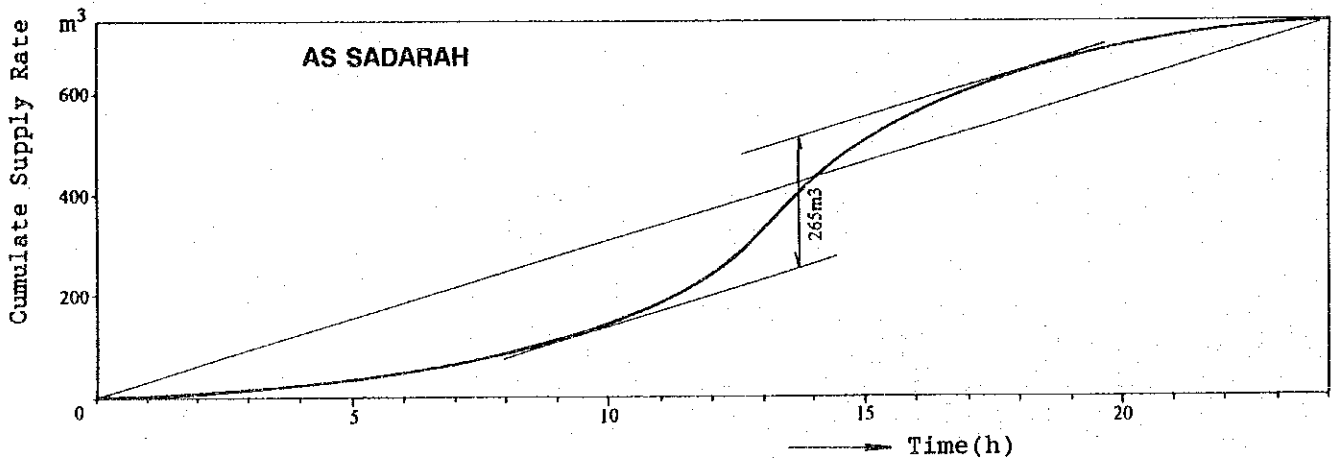


Appendix-IV.a Graphical Analysis of the Distribution Tank Capacity (2)

Site Name		AL-RAIDAH/ SHAMALYA (AL-SUFILA)
Population(2008)		6,730
Supply Rate		50 l/cap/day
Tank Capacity	Calculated	115m ³
	Projected	150m ³

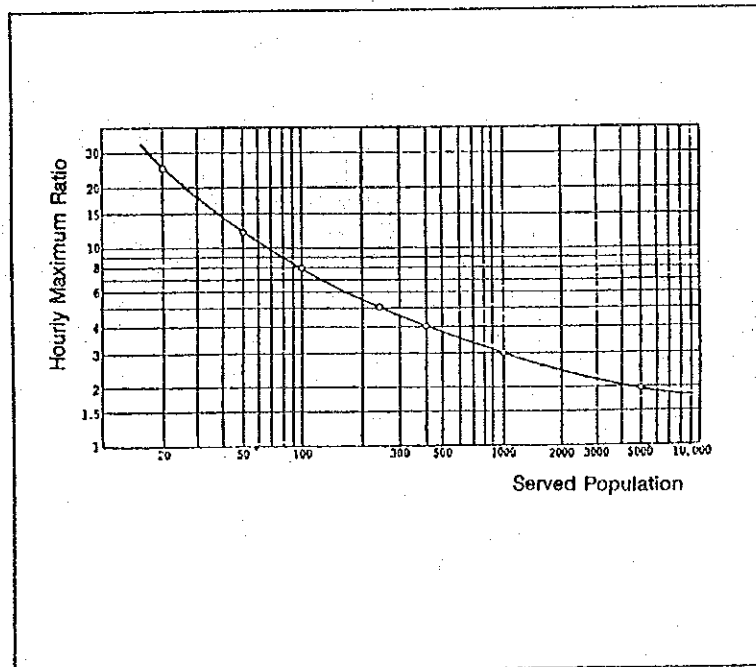


Site Name		AS SADARAH
Population(2008)		14,872
Supply Rate		50 l/cap/day
Tank Capacity	Calculated	265m ³
	Projected	300m ³



APPENDIX 4.b Calculation of Hourly Maximum Supply Rate

The hourly maximum supply rate indicates one of unit flow rates for hydraulic calculation when water consumption in a given community reaches its peak. The size of distribution line needs to depend upon this flow rate. The rate is often estimated on the basis of total volumes of flow discharged through taps assumed to be simultaneously opened at households. As one of the typical calculation method, the criteria of Japan's small-scale water facilities has proposed to employ "a ratio of hourly maximum flow versus daily maximum flow," which varies with the population of the community, as shown in the following graph:



**Ratio of Hourly Maximum Versus Daily Maximum Flow
Per the Number of Population
(Criteria for Small-Scale Water Facilities
by the Ministry of Health and Welfare)**

As a typical example, the hourly maximum flow for the central community of As-Sadarah is calculated as follows:

- 1) Present population: 4,600 (1993)
- 2) Planned served population: 6,191 (2008)
- 3) Planned daily average supply rate: $6,191 \times 50 \text{ lcd}$
= 310 m^3
- 4) Planned daily maximum supply rate: $310 \text{ m}^3 \times 1.3 = 400 \text{ m}^3$
- 5) Hourly maximum ratio per population: = 1.8 (from the graph)
- 6) Hourly maximum supply rate:
 $(400 \text{ m}^3 \times 1.8) / 24 \text{ hours} = 30 \text{ m}^3/\text{hr} = 500 \text{ lit}/\text{min}$

According to the result of the calculation, the size of distribution main to the As-Sadarah community is determined, employing the flow rate of 500 lit/min.

Appendix-IV.c Calculation of Water Tariff System

In reference to Sec.4.3.4, Chap.4, "Operation and Maintenance Plan", the basic financial calculations for the respective water offices involved in the project are separately presented in this Appendix.

The basic factors assumed for calculation are listed as follows:

1. Revenues

- (1) Revenues are calculated on the metered rates, assuming two (2) cases of accounted-for rates for the respective sites as follows:

a. Ahwar and Moodeyah	Desirable rate: 80 %
	Normal rate: 60 %
b. Al-Raidah/Shamalya & As-Sadarah	Desirable rate: 80 %
	Normal rate: 70 %

Since Ahwar and Moodeyah have existing networks which tend to have more or less leakage, the initial water fees are expected to be based upon the normal rate of 60%, while the other two sites where new facilities are to be installed could expect a higher rate of 80%. The recommended water tariffs for the respected sites are based upon these assumed accounted-for rates.

- (2) The fixed monthly rate per household assumes 9 members of a family, each of which consumes 50 lcd except for the case of Moodeyah where 40 lcd is assigned.
- (3) To calculate the ratio of household income against a monthly household water fee, each household is assumed to have a monthly income of YR 3,000 on average.

2. Expenditure

(1) Operation and maintenance cost

1) Fuel cost

The fuel costs for the respective sites are based upon the total volume of diesel fuel required for the operation of all the diesel engines and/or diesel generators for running hours to serve the required water supply quantities ranging from 8 to 16 hours/day. The current official price of YR 3.1 for one liter of diesel fuel is applied.

2) Maintenance cost

The maintenance cost includes the following costs mainly for power units:

- a. Lubricants: 10 % of fuel cost
- c. Replacement of consumable materials such as filters: 3 % of fuel cost

3) Operators' salary

- a. Staff members: Refer to Page IV-37 Table 4.7
- b. Salaries: Refer to Page IV-50

(2) Administration expenditure

The miscellaneous expenditures for the management of the respective water offices are assumed to be confined to 20 % of the total operation and maintenance cost including fuel costs and salaries.

(3) Expenditure for repair

This is earmarked mainly for the repair of pipelines. The estimate assumes to spend 3 % of the revenues.

(4) Investment for replacement of equipment

This is for the savings in preparation for the replacement in case of unexpected breakdowns of equipment which may be required every 5 years. The cost calculation is based upon the estimated prices of facilities for the project.

3. Depreciation of Facilities

- a. Prices of facilities: estimated prices for the project
- b. Foreign currency rate: one (1) U.S. dollar = YR 12
- c. Remaining values of facilities: 10 % of the initial prices

A H W A R Y

CASE (1): Collection ratio of billed services: 80%

	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue													
a. Tariff: YR/m ³	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	6.7
b. Average income per capita (month)	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	90.0
c. (Tariff/household/income) Ratio	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
d. Population	15,176.0	15,513.0	15,857.0	16,209.0	16,569.0	16,937.0	17,313.0	17,697.0	18,090.0	18,492.0	18,903.0	19,323.0	206,079.0
e. Number of household	1,636.0	1,723.0	1,801.0	1,881.0	1,961.0	2,043.0	2,123.0	2,206.0	2,291.0	2,378.0	2,466.0	2,555.0	22,893.0
f. Supply rate (m ³ /day)	758.8	773.7	792.5	810.5	828.5	846.9	865.7	884.9	904.5	924.6	945.2	966.2	10,304.0
g. Total billing revenue	1,484.5	1,517.5	1,551.1	1,585.6	1,620.8	1,656.8	1,693.6	1,731.1	1,769.6	1,808.9	1,848.1	1,890.2	20,158.5
Expenditure													
Operation and maintenance cost													
1. Fuel cost	451.8	461.7	471.6	482.3	493.0	504.1	515.2	526.3	538.6	550.0	562.3	575.0	6,132.1
2. Maintenance cost	22.6	23.1	23.6	24.1	24.7	25.2	25.8	26.3	26.9	27.5	28.1	28.7	306.6
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0
4. Sub-total	978.4	988.8	999.2	1,010.4	1,021.7	1,033.3	1,045.0	1,056.6	1,068.5	1,081.5	1,094.4	1,107.7	12,486.7
Administration expenditure	195.7	197.8	199.8	202.1	204.3	206.7	209.0	211.3	213.9	216.3	218.9	221.5	2,487.3
Expenditure for repair	44.5	45.5	46.5	47.6	48.6	49.7	50.8	51.9	53.1	54.3	55.5	56.7	604.8
Investment for replacement of equipment													244.4
Total expenditure	1,218.6	1,232.1	1,245.6	1,260.1	1,276.8	1,293.7	1,310.8	1,319.9	1,336.5	1,474.3	1,368.8	1,386.0	15,833.1
Operating profit	265.9	285.4	305.5	325.5	344.0	367.1	388.8	411.3	433.1	334.6	480.3	504.2	4,225.5
Depreciation	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	1,008.8
Profit	181.8	201.3	221.5	241.4	259.9	283.0	304.7	327.2	349.0	250.5	396.2	420.1	3,316.7
Accumulated profit	181.8	383.1	604.6	846.0	1,095.9	1,358.9	1,673.6	2,000.8	2,249.8	2,500.3	2,895.5	3,316.7	

CASE (2): Collection ratio of billed services: 60%

	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue													
a. Tariff: YR/m ³	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
b. Average income per capita (month)	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0
d. Population	15,176.0	15,513.0	15,857.0	16,209.0	16,569.0	16,937.0	17,313.0	17,697.0	18,090.0	18,492.0	18,903.0	19,323.0	206,079.0
e. Number of household	1,636.0	1,723.0	1,801.0	1,881.0	1,961.0	2,043.0	2,123.0	2,206.0	2,291.0	2,378.0	2,466.0	2,555.0	22,893.0
f. Supply rate (m ³ /day)	758.8	773.7	792.5	810.5	828.5	846.9	865.7	884.9	904.5	924.6	945.2	966.2	10,304.0
g. Total billing revenue	1,296.2	1,325.0	1,354.3	1,384.4	1,415.2	1,446.6	1,478.7	1,511.5	1,545.1	1,578.4	1,614.5	1,650.4	17,601.2
Expenditure													
Operation and maintenance cost													
1. Fuel cost	451.8	461.7	471.6	482.3	493.0	504.1	515.2	526.3	538.6	550.0	562.3	575.0	6,132.1
2. Maintenance cost	22.6	23.1	23.6	24.1	24.7	25.2	25.8	26.3	26.9	27.5	28.1	28.7	306.6
3. Operators Salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0
4. Sub-total	978.4	988.8	999.2	1,010.4	1,021.7	1,033.3	1,045.0	1,056.6	1,068.5	1,081.5	1,094.4	1,107.7	12,486.7
Administration expenditure	195.7	197.8	199.8	202.1	204.3	206.7	209.0	211.3	213.9	216.3	218.9	221.5	2,487.3
Expenditure for repair	38.9	39.7	40.6	41.5	42.5	43.4	44.4	45.3	46.4	47.4	48.4	49.5	528.0
Investment for replacement of equipment													244.4
Total expenditure	1,213.0	1,226.3	1,239.7	1,254.1	1,269.6	1,283.4	1,298.3	1,313.3	1,328.7	1,467.4	1,361.8	1,378.8	15,756.4
Operating profit	83.2	98.6	114.7	130.3	145.6	163.2	180.4	198.2	215.3	112.0	252.7	271.6	1,844.8
Depreciation	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	1,008.8
Profit	-0.9	14.6	30.6	46.3	61.5	79.1	96.3	114.2	131.3	27.9	168.7	187.5	336.0
Accumulated profit	-0.9	13.7	44.3	90.5	152.0	231.1	327.4	441.6	582.9	419.8	648.5	836.0	

Composition of depreciation

Durable years	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Price	101.23												
40	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	27.33
15	21.99	21.99	21.99	21.99	21.99	21.99	21.99	21.99	21.99	21.99	21.99	21.99	263.93
55	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	43.46
60	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	159.89
40	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	37.21
25	39.75	39.75	39.75	39.75	39.75	39.75	39.75	39.75	39.75	39.75	39.75	39.75	477.01
Total	84.07	84.07	84.07	84.07	84.07	84.07	84.07	84.07	84.07	84.07	84.07	84.07	1,008.84

Tariff: YR: Average income per capita: YR/month: Others: thousand YR/year

CASE (1): Collection ratio of billed services: 80% 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 Total

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue															
a. Tariff: YR/m ³	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
b. Average income per capita (month)	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0
d. Population	25,022.0	25,582.0	25,582.0	26,155.0	26,741.0	27,340.0	27,340.0	27,932.0	28,518.0	29,115.0	29,712.0	30,308.0	31,225.0	31,924.0	340,150.0
e. Number of household	2,780.0	2,842.0	2,906.0	2,971.0	3,037.0	3,105.0	3,175.0	3,246.0	3,319.0	3,393.0	3,469.0	3,547.0	3,624.0	3,700.0	37,790.0
f. Supply rate: (m ³ /day)	1,000.9	1,023.3	1,043.2	1,069.5	1,093.6	1,118.1	1,143.1	1,168.7	1,194.9	1,221.6	1,249.0	1,277.0	1,305.0	1,333.0	13,606.0
g. Total billing revenue	2,016.6	2,081.7	2,155.1	2,207.9	2,263.4	2,320.4	2,378.7	2,437.7	2,497.4	2,557.4	2,617.9	2,678.9	2,740.4	2,802.4	27,413.4
Expenditure															
1. Fuel cost	804.7	822.1	840.7	859.7	879.1	898.5	918.3	939.3	959.5	980.9	1,003.9	1,026.0	1,049.0	1,072.0	10,932.8
2. Maintenance cost	40.2	41.1	42.0	43.0	44.0	44.9	45.9	46.9	47.9	48.0	49.0	50.2	51.3	51.3	546.6
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0
4. Sub-total	1,348.9	1,367.2	1,386.7	1,406.7	1,427.1	1,447.5	1,468.2	1,489.2	1,511.5	1,533.9	1,557.4	1,581.3	1,605.3	1,629.3	17,527.4
Administration expenditure	289.3	273.4	277.3	281.3	285.4	289.5	293.6	297.7	301.8	305.9	310.0	314.1	318.2	322.3	3,505.5
Expenditure for repair	60.5	61.9	63.2	64.7	66.1	67.6	69.1	70.6	72.2	73.8	75.5	77.2	78.9	80.6	822.4
Investment for replacement of equipment	-	-	-	-	187.4	-	-	-	-	187.4	-	-	-	-	374.8
Total expenditure	1,679.2	1,702.5	1,727.3	1,752.7	1,778.6	1,804.5	1,831.0	1,858.0	1,885.0	1,912.4	1,940.2	1,968.2	1,996.5	2,025.1	22,230.1
Operating profit	337.4	359.2	380.6	402.4	427.4	448.2	472.2	495.8	521.4	549.4	576.7	603.8	631.0	658.1	5,183.3
Depreciation	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	1,214.3
Profit	236.2	258.0	279.4	301.2	326.2	347.0	371.0	394.6	420.2	448.2	475.5	502.6	529.8	556.9	3,969.0
Accumulated profit	236.2	494.2	773.6	1,074.8	1,411.0	1,792.6	2,214.6	2,686.2	3,207.4	3,782.6	4,414.1	5,103.7	5,858.7	6,674.6	33,969.0

CASE (2): Collection ratio of billed services: 60%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	
Revenue														
a. Tariff: YR/m ³	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	
b. Average income per capita (month)	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	
d. Population	25,022.0	25,582.0	26,155.0	26,741.0	27,340.0	27,932.0	28,518.0	29,115.0	29,712.0	30,308.0	31,225.0	31,924.0	340,150.0	
e. Number of household	2,780.0	2,842.0	2,906.0	2,971.0	3,037.0	3,105.0	3,175.0	3,246.0	3,319.0	3,393.0	3,469.0	3,547.0	37,790.0	
f. Supply rate: (m ³ /day)	1,000.9	1,023.3	1,043.2	1,069.5	1,093.6	1,118.1	1,143.1	1,168.7	1,194.9	1,221.6	1,249.0	1,277.0	13,606.0	
g. Total billing revenue	1,819.3	1,860.0	1,901.7	1,944.3	1,987.8	2,032.3	2,077.8	2,124.4	2,171.9	2,220.5	2,270.3	2,321.1	24,731.6	
Expenditure														
1. Fuel cost	804.7	822.1	840.7	859.7	878.1	898.5	918.3	939.3	959.5	980.9	1,003.9	1,026.0	10,932.8	
2. Maintenance cost	40.2	41.1	42.0	43.0	44.0	44.9	45.9	46.9	47.9	48.0	49.0	50.2	546.6	
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0	
4. Sub-total	1,348.9	1,367.2	1,386.7	1,406.7	1,427.1	1,447.5	1,468.2	1,489.2	1,511.5	1,533.9	1,557.4	1,581.3	17,527.4	
Administration expenditure	289.3	273.4	277.3	281.3	285.4	289.5	293.6	297.7	301.8	305.9	310.0	314.1	3,505.5	
Expenditure for repair	54.6	55.3	57.1	58.3	59.6	61.0	62.3	63.7	65.2	66.6	68.1	69.6	741.9	
Investment for replacement of equipment	-	-	-	-	187.4	-	-	-	-	187.4	-	-	-	374.8
Total expenditure	1,679.2	1,696.4	1,721.1	1,746.4	1,771.5	1,797.9	1,824.2	1,852.1	1,879.8	1,908.7	1,937.8	1,967.2	22,149.6	
Operating profit	140.1	163.6	181.0	197.9	210.3	234.4	253.5	272.3	293.0	314.6	337.5	361.9	2,582.0	
Depreciation	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	1,214.3	
Profit	44.8	62.4	79.8	96.7	109.1	133.2	152.3	171.1	191.8	213.4	236.3	260.7	1,367.7	
Accumulated profit	44.8	107.2	186.6	283.3	392.4	525.6	677.9	849.0	1,040.8	1,254.2	1,490.5	1,751.2	1,367.7	

Composition of depreciation

Durable years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Price	260.63	260.63	260.63	260.63	260.63	260.63	260.63	260.63	260.63	260.63	260.63	260.63	3,353.11
40	562.15	562.15	562.15	562.15	562.15	562.15	562.15	562.15	562.15	562.15	562.15	562.15	7,027.8
15	241.21	241.21	241.21	241.21	241.21	241.21	241.21	241.21	241.21	241.21	241.21	241.21	3,015.6
55	617.08	617.08	617.08	617.08	617.08	617.08	617.08	617.08	617.08	617.08	617.08	617.08	7,813.0
60	874.03	874.03	874.03	874.03	874.03	874.03	874.03	874.03	874.03	874.03	874.03	874.03	10,912.4
40	19.67	19.67	19.67	19.67	19.67	19.67	19.67	19.67	19.67	19.67	19.67	19.67	246.2
25	798.01	798.01	798.01	798.01	798.01	798.01	798.01	798.01	798.01	798.01	798.01	798.01	9,975.6
Total	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	3,353.11	41,413.4

Tariff: YR; Average income per capita: YR/month; Others: thousand YR/year

CASE (1): Collection ratio of billed services: 80%

	1986	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue														
a. Tariff: YR/m ³	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
b. Average income per capita (month)	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0
d. Population	10,175.0	10,378.0	10,587.0	10,799.0	11,015.0	11,235.0	11,460.0	11,689.0	11,923.0	12,161.0	12,404.0	12,652.0	12,900.0	136,472.0
e. Number of household	1,100.0	1,153.0	1,176.0	1,199.0	1,223.0	1,248.0	1,273.0	1,298.0	1,324.0	1,351.0	1,378.0	1,405.0	1,432.0	15,158.0
f. Supply rate (m ³ /day)	508.8	519.0	529.4	540.0	550.8	561.8	573.0	584.5	596.2	608.1	620.2	632.6	645.1	6,824.0
g. Total billing revenue	1,619.2	1,651.7	1,684.8	1,718.6	1,752.9	1,787.9	1,823.7	1,860.2	1,897.4	1,935.3	1,974.0	2,013.4	2,052.8	21,719.3
Expenditure														
1. Fuel cost	720.3	734.2	748.8	763.5	779.3	794.4	811.0	826.8	843.5	860.5	877.5	895.4	913.3	9,655.3
2. Maintenance cost	36.0	37.4	38.2	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	482.8
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	5,048.0
4. Sub-total	1,260.3	1,275.6	1,290.8	1,305.7	1,322.3	1,338.1	1,355.6	1,372.2	1,389.7	1,407.5	1,425.4	1,444.1	1,462.3	16,186.0
Administration expenditure	252.1	255.0	258.1	261.1	264.5	267.6	271.1	274.4	277.9	281.5	285.1	288.8	292.5	3,237.2
Investment for replacement of equipment	48.6	48.6	50.5	51.6	52.6	53.6	54.7	55.8	56.9	58.1	59.2	60.4	61.5	651.6
Total expenditure	1,561.0	1,578.4	1,589.9	1,618.4	1,730.6	1,659.4	1,681.4	1,702.4	1,724.5	1,838.3	1,769.7	1,793.4	1,817.3	20,377.3
Operating profit	58.3	72.3	85.9	100.2	37.6	128.6	142.5	157.8	172.9	177.0	176.5	179.9	185.4	1,342.0
Depreciation	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	1,527.4
Profit	-69.0	-55.0	-41.3	-27.1	-89.7	101.3	15.2	30.5	45.6	50.0	49.2	52.6	58.1	-185.4
Accumulated profit	-69.0	-124.0	-165.4	-192.5	-357.4	-356.1	-341.0	-310.3	-264.9	-355.2	-278.3	-183.5	-	-

CASE (2): Collection ratio of billed services: 70%

	1986	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue														
a. Tariff: YR/m ³	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
b. Average income per capita (month)	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0	165.0
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0
d. Population	10,175.0	10,378.0	10,587.0	10,799.0	11,015.0	11,235.0	11,460.0	11,689.0	11,923.0	12,161.0	12,404.0	12,652.0	12,900.0	136,472.0
e. Number of household	1,100.0	1,153.0	1,176.0	1,199.0	1,223.0	1,248.0	1,273.0	1,298.0	1,324.0	1,351.0	1,378.0	1,405.0	1,432.0	15,158.0
f. Supply rate (m ³ /day)	508.8	519.0	529.4	540.0	550.8	561.8	573.0	584.5	596.2	608.1	620.2	632.6	645.1	6,824.0
g. Total billing revenue	1,585.8	1,617.6	1,650.0	1,683.1	1,716.7	1,751.0	1,785.1	1,821.8	1,858.3	1,895.4	1,933.2	1,971.9	2,010.9	21,270.9
Expenditure														
1. Fuel cost	720.3	734.2	748.8	763.5	779.3	794.4	811.0	826.8	843.5	860.5	877.5	895.4	913.3	9,655.3
2. Maintenance cost	36.0	37.4	38.2	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	482.8
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	5,048.0
4. Sub-total	1,260.3	1,275.6	1,290.8	1,305.7	1,322.3	1,338.1	1,355.6	1,372.2	1,389.7	1,407.5	1,425.4	1,444.1	1,462.3	16,186.0
Administration expenditure	252.1	255.0	258.1	261.1	264.5	267.6	271.1	274.4	277.9	281.5	285.1	288.8	292.5	3,237.2
Investment for replacement of equipment	47.6	48.5	48.5	50.5	51.5	52.5	53.6	54.7	55.7	56.9	58.0	59.2	60.4	651.6
Total expenditure	1,580.0	1,578.4	1,587.8	1,617.3	1,739.5	1,658.2	1,680.3	1,701.3	1,723.3	1,837.1	1,768.5	1,792.1	1,816.0	20,383.8
Operating profit	25.8	39.2	52.2	65.8	77.2	91.5	104.0	117.5	131.0	147.9	158.7	171.8	184.9	907.1
Depreciation	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	1,527.4
Profit	-101.4	-88.1	-75.1	-61.5	-50.1	-35.8	-22.3	-9.8	3.7	20.6	31.4	44.5	57.6	-620.3
Accumulated profit	-101.4	-189.5	-264.6	-326.1	-376.2	-411.0	-440.7	-465.5	-486.4	-503.4	-517.4	-528.4	-536.4	-

Composition of depreciation

Durable years	1987	1988	1989	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
40	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	116.29
15	27.22	27.22	27.22	27.22	27.22	27.22	27.22	27.22	27.22	27.22	27.22	27.22	326.66
55	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53	54.31
60	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	97.54
25	77.72	77.72	77.72	77.72	77.72	77.72	77.72	77.72	77.72	77.72	77.72	77.72	932.64
Total	127.28	127.28	127.28	127.28	127.28	127.28	127.28	127.28	127.28	127.28	127.28	127.28	1,527.44

Tariff: YR; Average income per capita: YR/month; Others: thousand YR/year

CASE (1): Collection ratio of billed services: 80%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue													
a. Tariff: YR/m ³	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	
b. Average income per capita (month)	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	
d. Population	11,807.0	12,145.0	12,388.0	12,636.0	12,888.0	13,147.0	13,410.0	13,678.0	13,952.0	14,231.0	14,516.0	14,806.0	158,705.0
e. Number of household	1,323.0	1,348.0	1,375.0	1,404.0	1,432.0	1,460.0	1,489.0	1,519.0	1,550.0	1,581.0	1,612.0	1,645.0	17,741.0
f. Supply rate (m ³ /day)	585.4	607.3	619.4	631.8	644.5	657.4	670.5	683.3	697.6	711.6	725.8	740.3	7,985.3
g. Total billing revenue	1,356.0	1,383.1	1,410.7	1,439.0	1,467.8	1,497.2	1,527.1	1,557.7	1,588.9	1,620.6	1,653.1	1,686.1	18,187.2
Expenditure													
Operation and maintenance cost													
1. Fuel cost	429.7	438.8	447.5	456.6	465.3	474.8	484.7	493.8	503.7	513.6	523.9	534.2	5,766.6
2. Maintenance cost	21.5	21.9	22.4	22.8	23.3	23.7	24.2	24.7	25.2	25.7	26.2	26.7	288.3
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0
4. Sub-total	855.1	964.7	973.9	983.4	992.6	1,002.5	1,012.9	1,022.5	1,032.9	1,043.3	1,054.1	1,064.9	12,102.9
Administration expenditure	191.0	192.9	194.8	196.7	198.5	200.5	202.6	204.5	206.5	208.7	210.8	213.0	2,420.6
Expenditure for repair	-	40.7	42.3	43.2	44.0	44.9	45.8	46.7	47.7	48.6	49.5	50.6	545.6
Investment for replacement of equipment	-	-	-	-	149.5	-	-	-	-	149.5	-	-	299.1
Total expenditure	1,186.9	1,199.1	1,210.8	1,223.3	1,234.6	1,248.0	1,261.3	1,273.7	1,287.1	1,450.1	1,314.5	1,328.5	15,368.1
Operating profit	169.1	183.9	199.8	215.7	233.2	249.2	265.8	283.9	301.7	170.5	338.6	357.6	2,819.1
Depreciation	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	1,544.5
Profit	40.4	55.2	71.1	87.0	104.5	120.5	137.1	155.2	173.0	41.8	209.9	228.9	1,274.5
Accumulated profit	40.4	95.6	166.7	253.7	358.2	478.7	615.7	771.0	944.0	835.8	1,045.6	1,274.5	

CASE (2): Collection ratio of billed services: 70%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Revenue													
a. Tariff: YR/m ³	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	
b. Average income per capita (month)	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	
c. (Tariff/household/income) Ratio	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	
d. Population	11,907.0	12,145.0	12,388.0	12,636.0	12,888.0	13,147.0	13,410.0	13,678.0	13,952.0	14,231.0	14,516.0	14,806.0	159,705.0
e. Number of household	1,323.0	1,348.0	1,375.0	1,404.0	1,432.0	1,460.0	1,489.0	1,519.0	1,550.0	1,581.0	1,612.0	1,645.0	17,741.0
f. Supply rate (m ³ /day)	585.4	607.3	619.4	631.8	644.5	657.4	670.5	683.3	697.6	711.6	725.8	740.3	7,985.3
g. Total billing revenue	1,277.7	1,303.3	1,329.4	1,356.0	1,383.1	1,410.8	1,439.0	1,467.8	1,497.2	1,527.1	1,557.7	1,588.8	17,197.9
Expenditure													
Operation and maintenance cost													
1. Fuel cost	429.7	438.8	447.5	456.6	465.3	474.8	484.7	493.8	503.7	513.6	523.9	534.2	5,766.6
2. Maintenance cost	21.5	21.9	22.4	22.8	23.3	23.7	24.2	24.7	25.2	25.7	26.2	26.7	288.3
3. Operators salary	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	504.0	6,048.0
4. Sub-total	955.1	964.7	973.9	983.4	992.6	1,002.5	1,012.9	1,022.5	1,032.9	1,043.3	1,054.1	1,064.9	12,102.9
Administration expenditure	191.0	192.9	194.8	196.7	198.5	200.5	202.6	204.5	206.5	208.7	210.8	213.0	2,420.6
Expenditure for repair	-	38.3	39.1	40.7	41.5	42.3	43.2	44.0	44.9	45.8	46.7	47.7	514.1
Investment for replacement of equipment	-	-	-	-	149.5	-	-	-	-	149.5	-	-	299.1
Total expenditure	1,194.5	1,196.7	1,208.5	1,220.8	1,232.1	1,245.4	1,258.7	1,271.0	1,284.4	1,447.3	1,311.7	1,325.6	15,368.1
Operating profit	83.2	106.5	120.9	135.2	150.5	165.4	180.3	195.7	212.8	79.8	246.1	253.3	1,801.3
Depreciation	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	1,544.5
Profit	-45.5	-22.2	-7.9	6.5	21.8	36.7	51.6	66.5	84.1	-48.9	117.3	134.6	255.7
Accumulated profit	-45.5	-67.7	-75.6	-69.1	-47.8	-11.1	34.5	91.0	175.1	4.2	212.6	255.7	

Composition of depreciation

Durable years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
40	73.17	73.17	73.17	73.17	73.17	73.17	73.17	73.17	73.17	73.17	73.17	73.17	19.75
15	448.61	448.61	448.61	448.61	448.61	448.61	448.61	448.61	448.61	448.61	448.61	448.61	328.00
55	314.88	314.88	314.88	314.88	314.88	314.88	314.88	314.88	314.88	314.88	314.88	314.88	61.83
60	601.53	601.53	601.53	601.53	601.53	601.53	601.53	601.53	601.53	601.53	601.53	601.53	108.28
25	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	2,388.12	1,031.87
Total	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	3,826.31	1,544.35

Tariff: YR: Average income per capita: YR/month: Others: thousand YR/year

APPENDIX V

BASIC DESIGN DRAWINGS

THE REPUBLIC OF YEMEN

GENERAL AUTHORITY FOR RURAL ELECTRICITY AND WATER
MINISTRY OF ELECTRICITY AND WATER

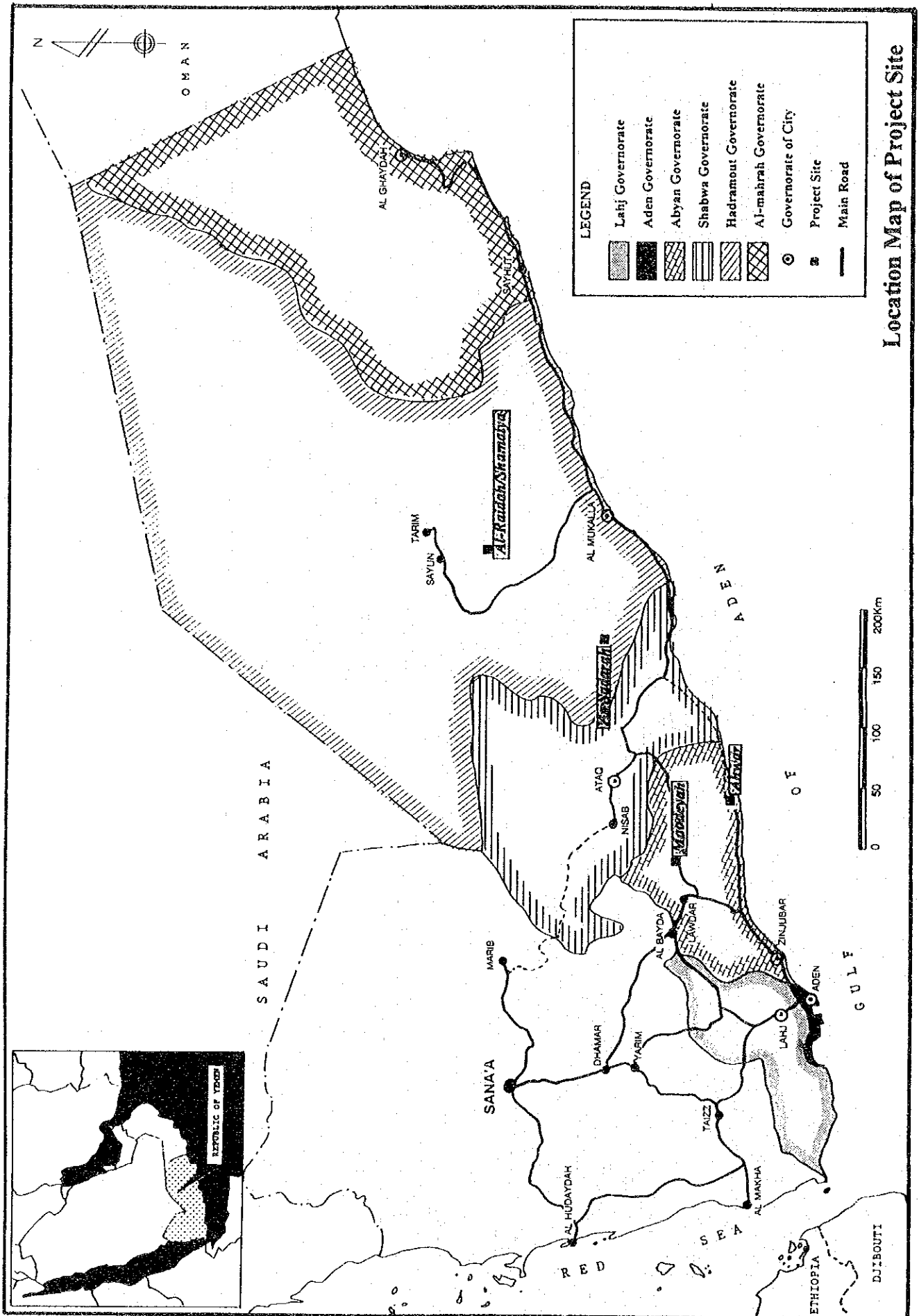
THE PROJECT FOR RURAL WATER SUPPLY

BASIC DESIGN
DRAWINGS

APRIL, 1994

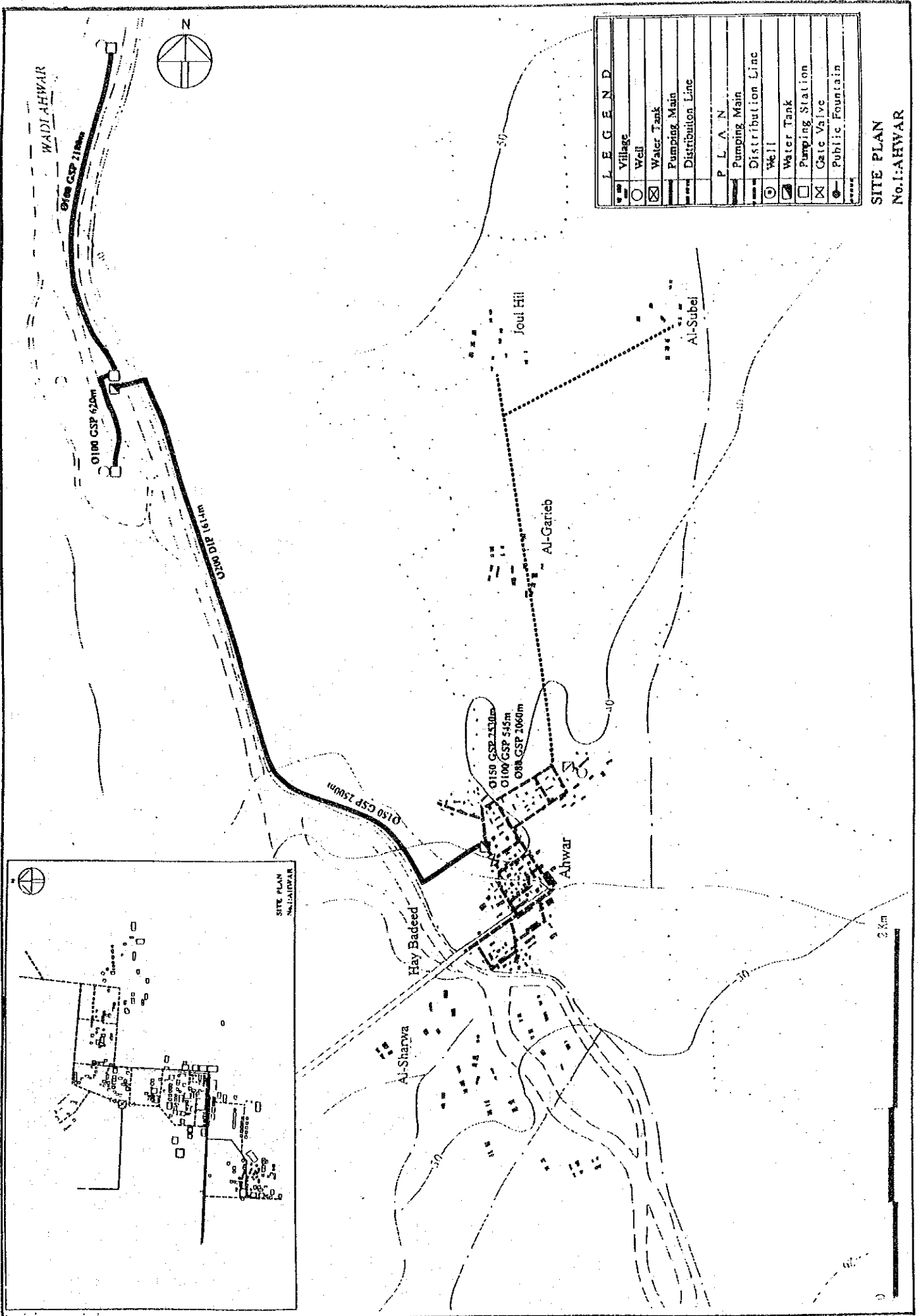
JAPAN TECHNICO CO., LTD
TOKYO, JAPAN

DRAWING TITLE	DWG.No.	DRAWING TITLE	DWG.No.
List of Drawings	V-1	Typical Pump House construction Type C	V-15
Location Map of Project Site	V-2	Typical Pump House construction Type D	V-16
A. FLOW DIAGRAM OF SITE PLAN		Layout Plan for Intake	V-17
No.1 Ahwar	V-3	Layout Plan for Water Tank : 100m3	V-18
No.2 Moodeyah	V-5	Layout Plan for Water Tank : 300m3	V-20
No.4 Al-Raidah / Shamalya	V-7	Layout Plan for Elevated Tank : 250m3	V-22
No.5 As Sadarah	V-9	Public Fountain 6-Tap	V-23
B. DETAILS OF WATER SUPPLY FACILITIES		Public Fountain 4-Tap	V-24
Typical Structure of Project Wells	V-11	Public Fountain 2-Tap	V-25
Typical Structure of Project Wells	V-12	Pipeline Protection for Wadi Crossing	V-26
Typical Pump House construction Type A	V-13		
Typical Pump House construction Type B	V-14		



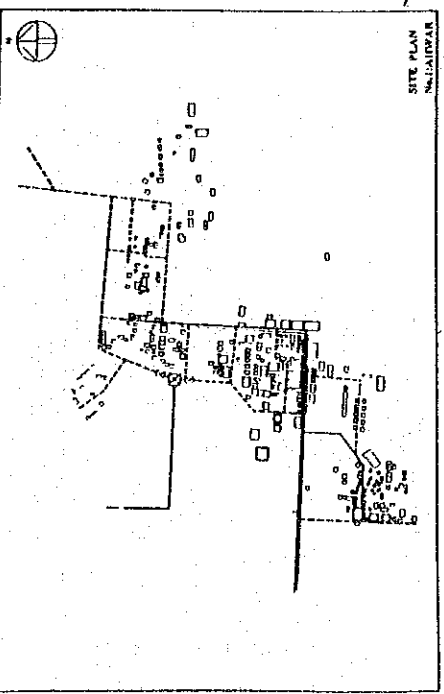
Location Map of Project Site

A. FLOW DIAGRAM OF SITE PLAN

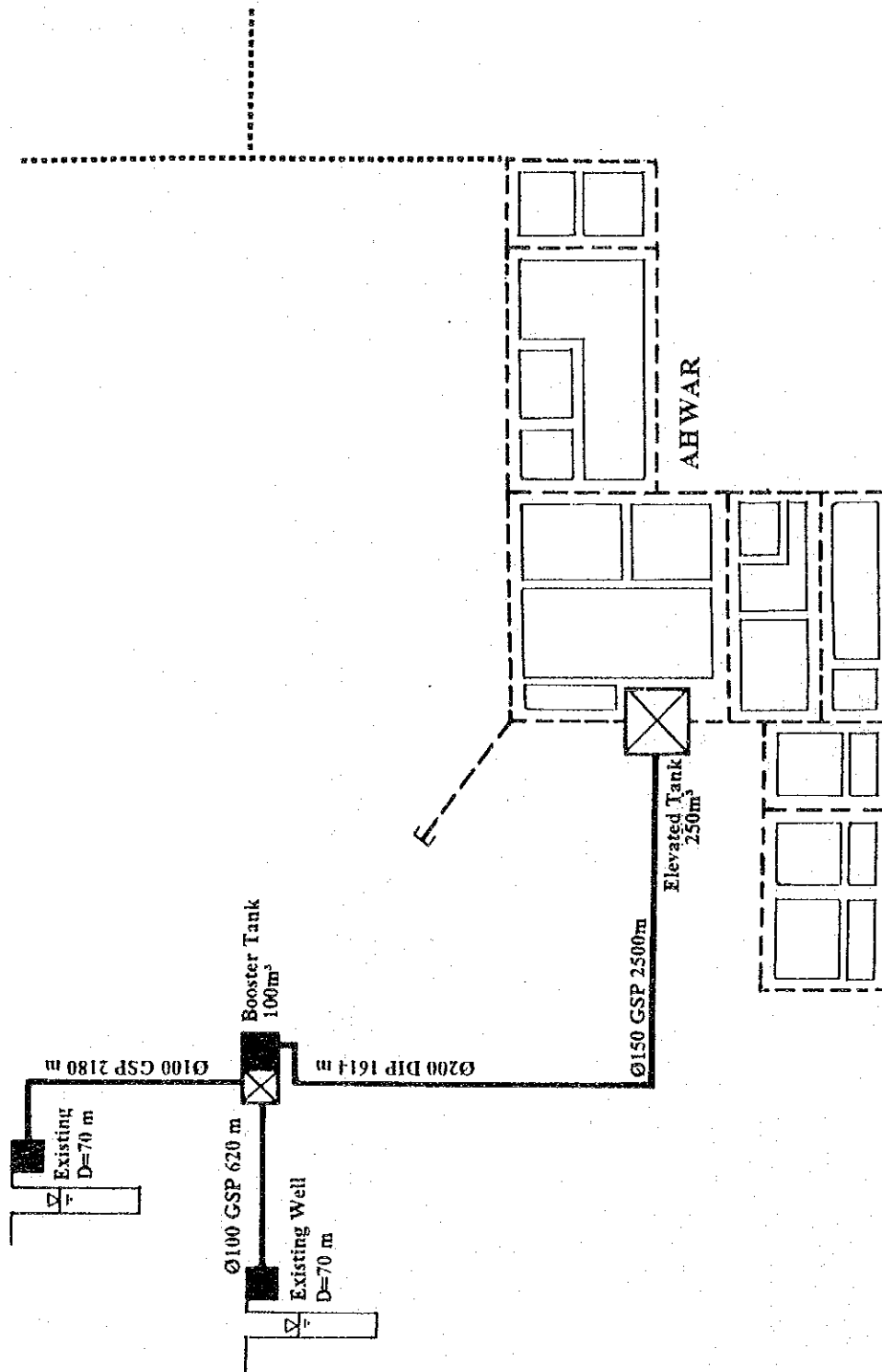


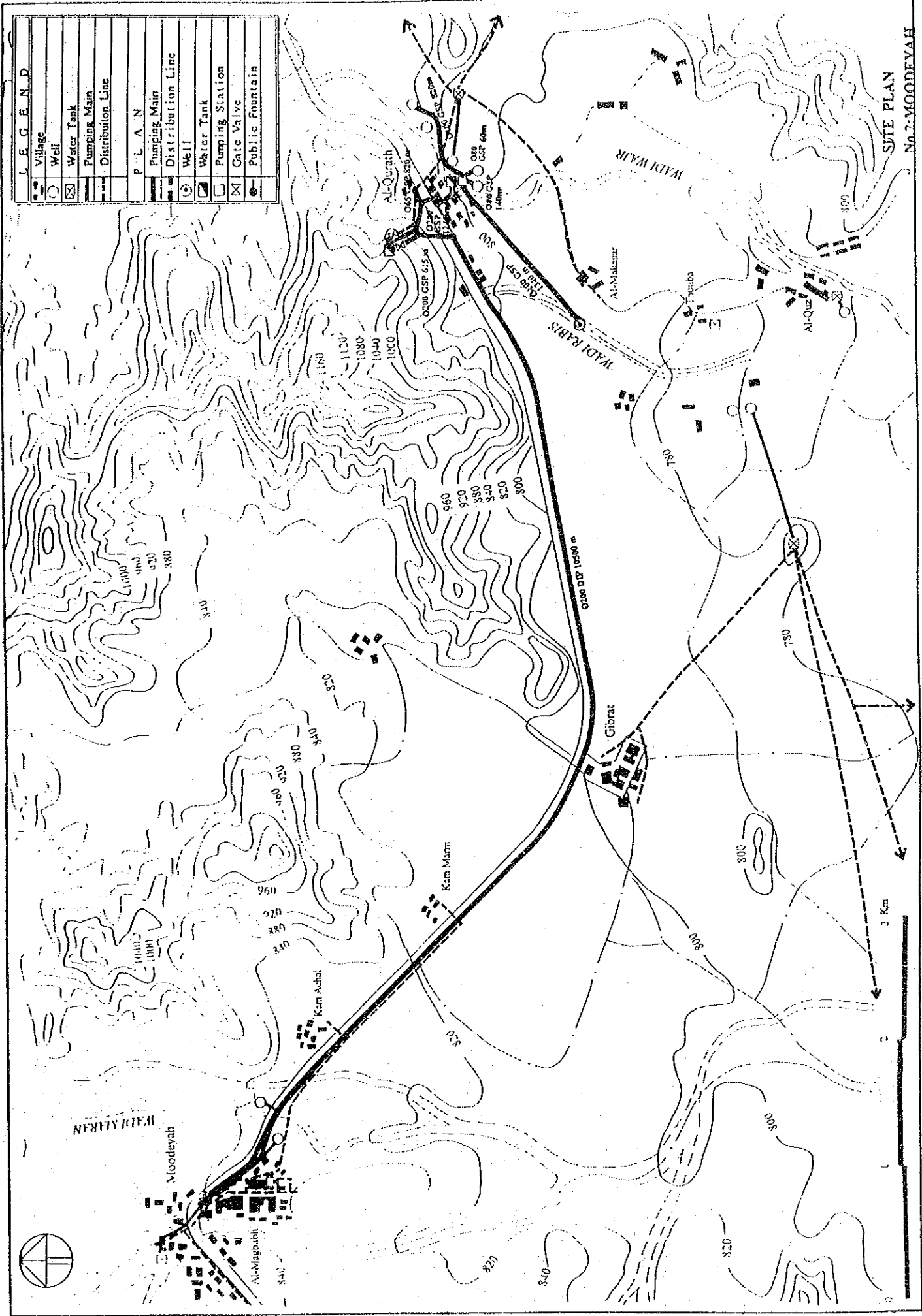
L E G E N D	
	Village
	Well
	Water Tank
	Pumping Main
	Distribution Line
P L A N	
	Pumping Main
	Distribution Line
	Well
	Water Tank
	Pumping Station
	Gate Valve
	Public Fountain

SITE PLAN
No. I-AHWAR



FLOW DIAGRAM
No.1:AHWAR

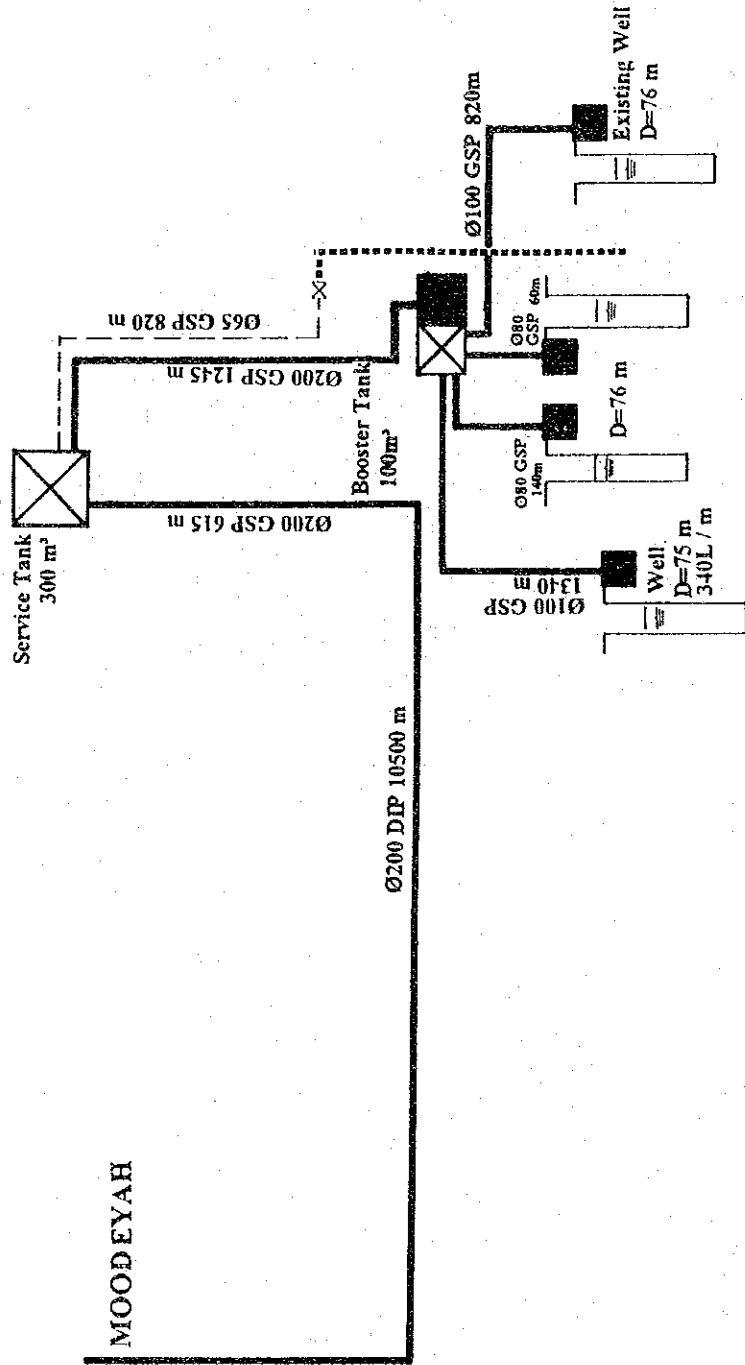




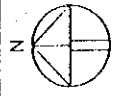
L E G E N D	
	Village
	Well
	Water Tank
	Pumping Main
	Distribution Line
P L A N	
	Pumping Main
	Distribution Line
	Well
	Water Tank
	Pumping Station
	Gate Valve
	Public Fountain

SITE PLAN
No. 2, MOODEYAH

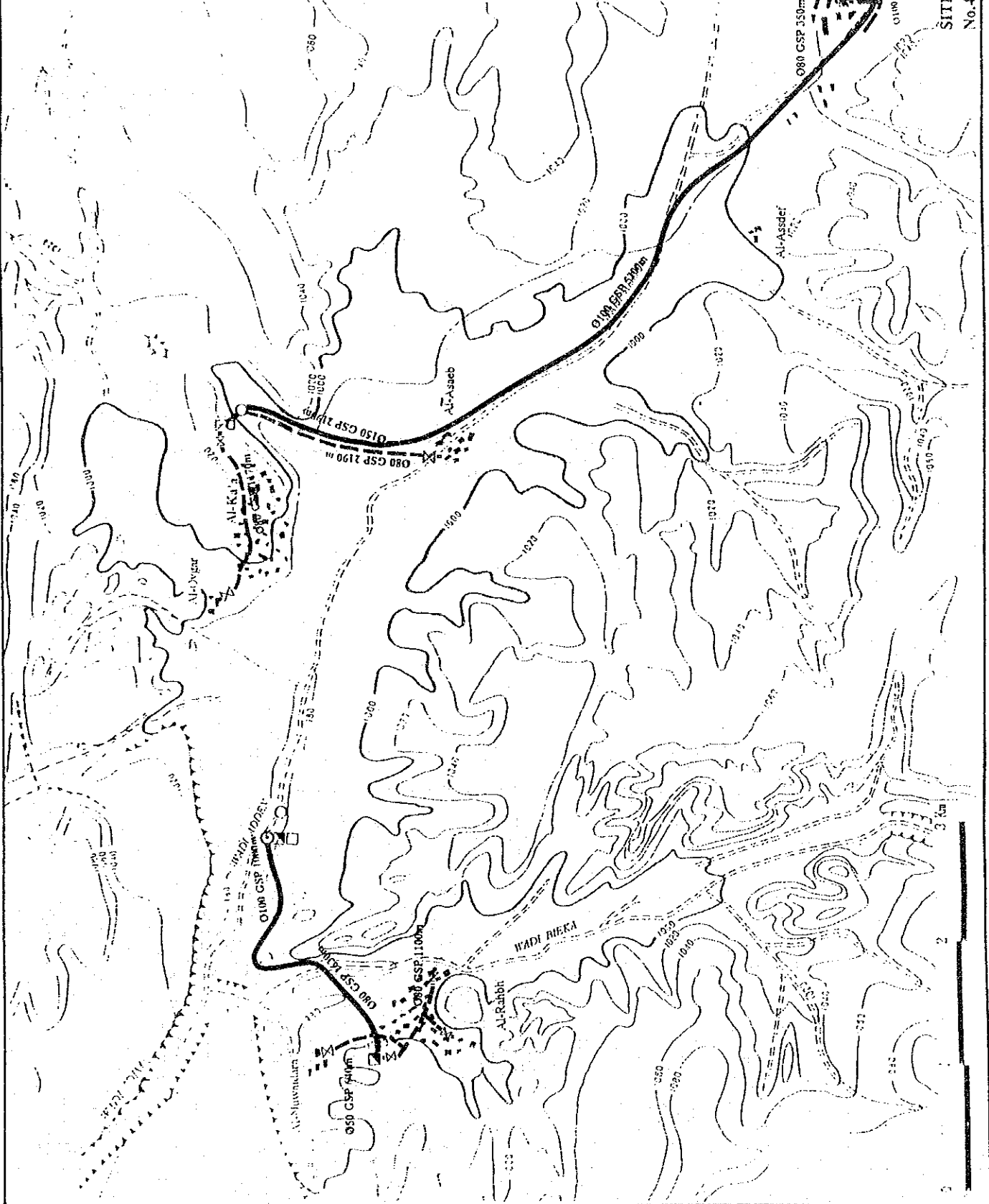
MOODEYAH



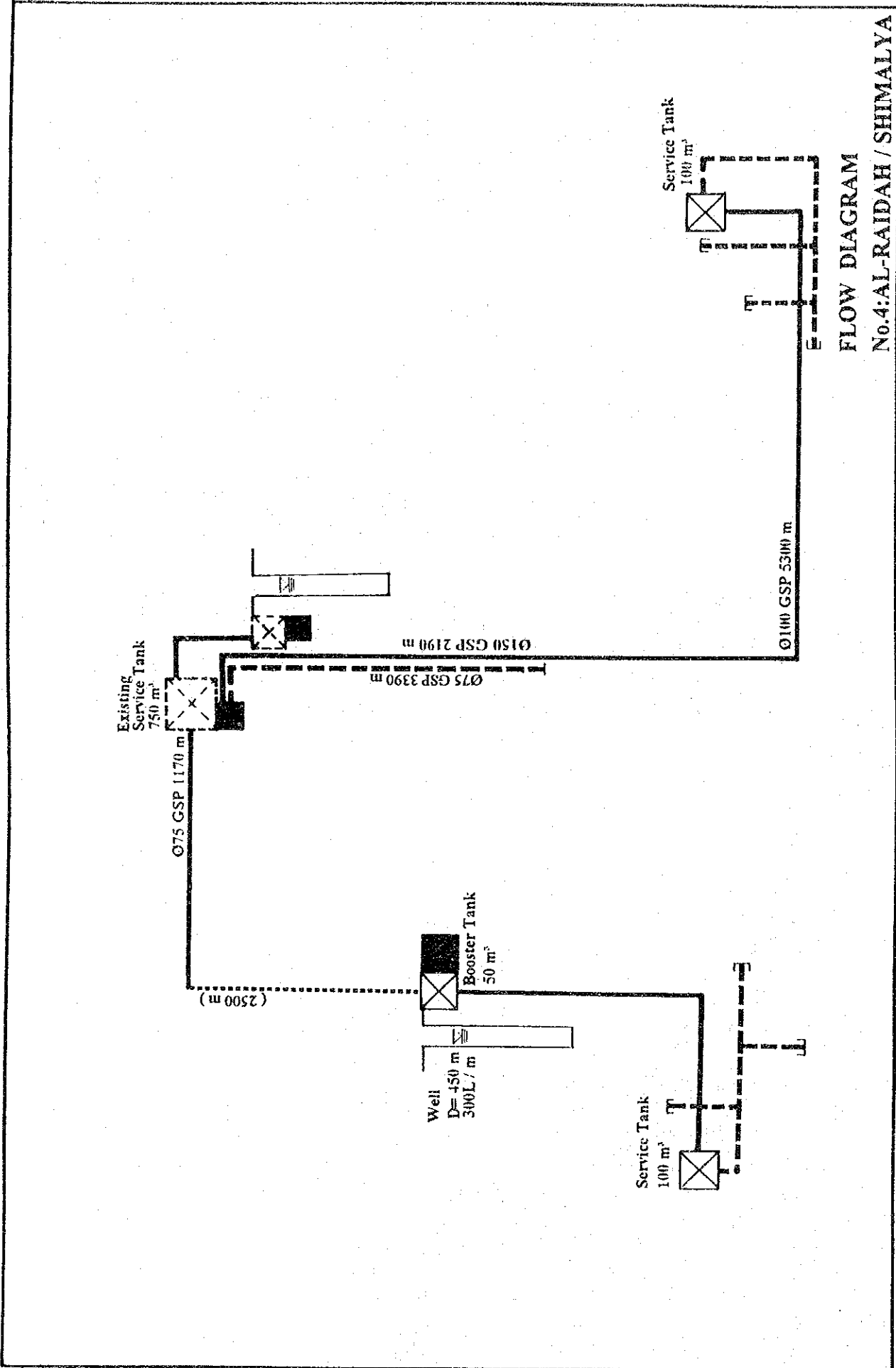
FLOW DIAGRAM
No.2:MOODEYAH



L E G E N D	
	Village
	Well
	Water Tank
	Pumping Main
	Distribution Line
P L A N	
	Pumping Main
	Distribution Line
	Well
	Water Tank
	Pumping Station
	Gate Valve
	Public Fountain

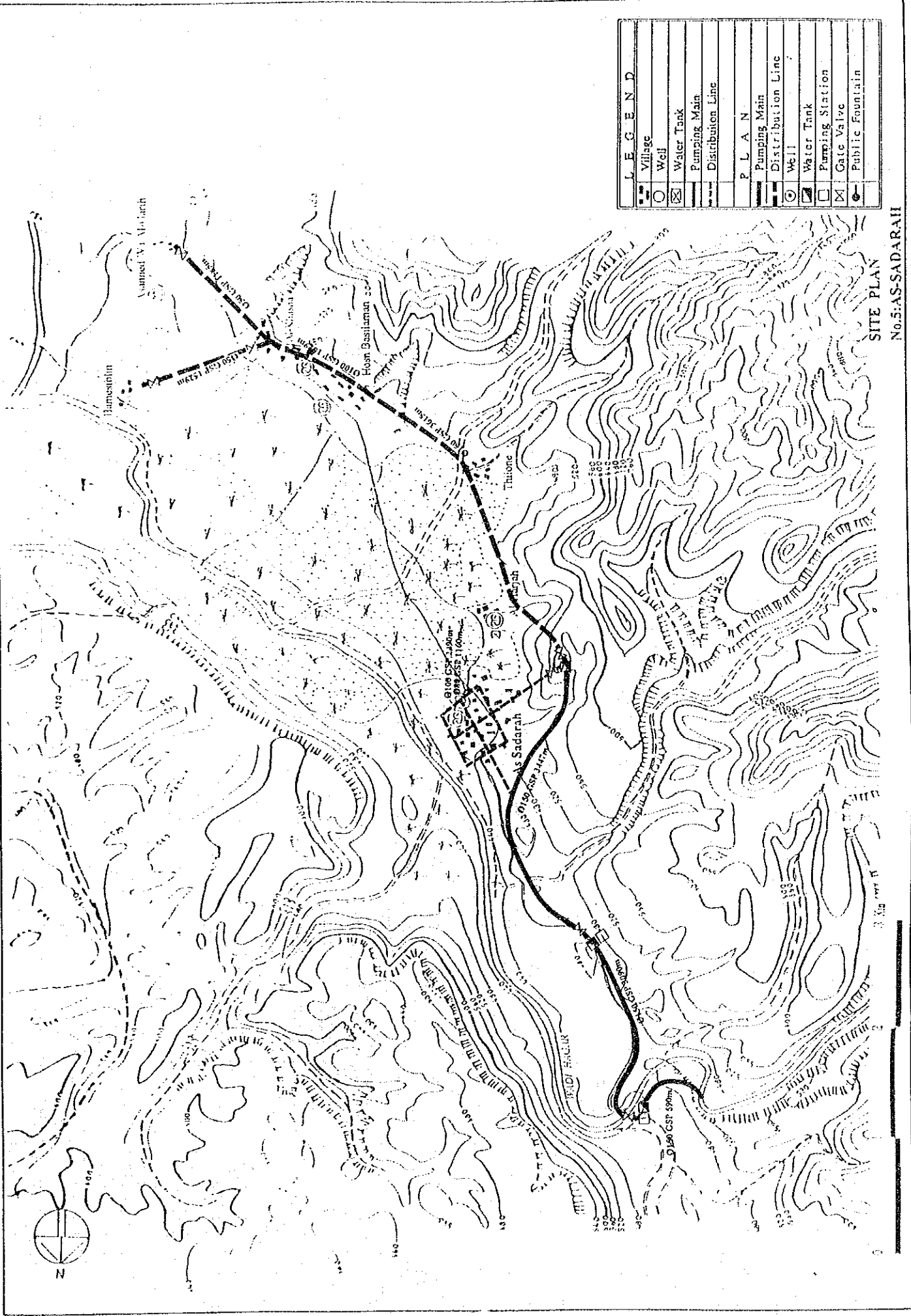


SITE PLAN
No.4:AL-RAIDAH/SHIMALYA



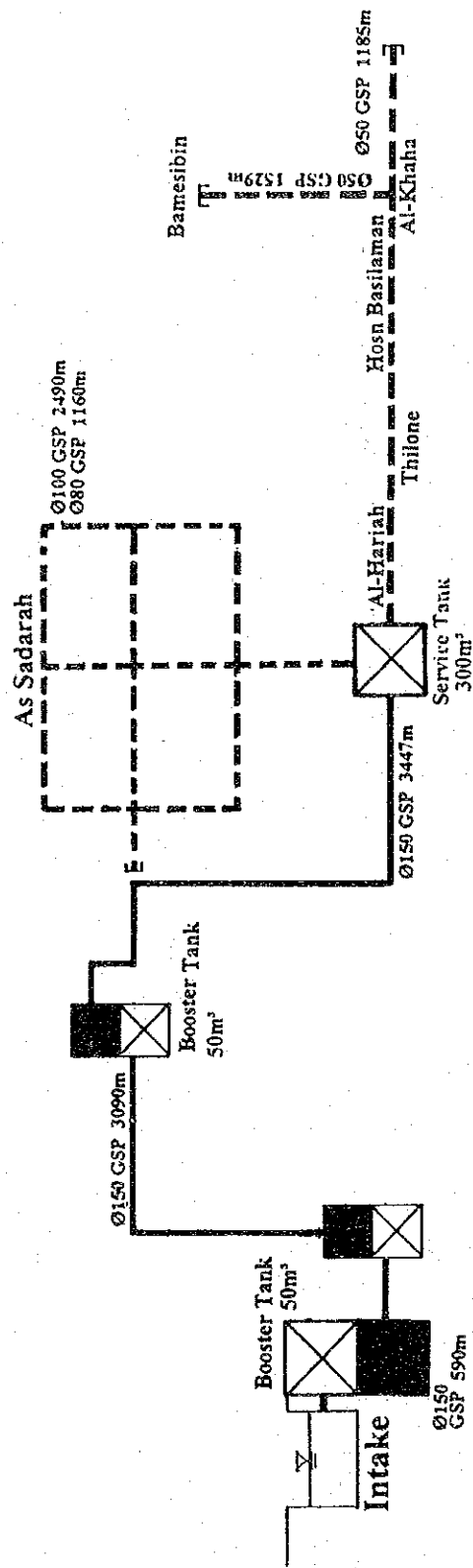
FLOW DIAGRAM

No.4:AL-RAIDAH / SHIMALYA



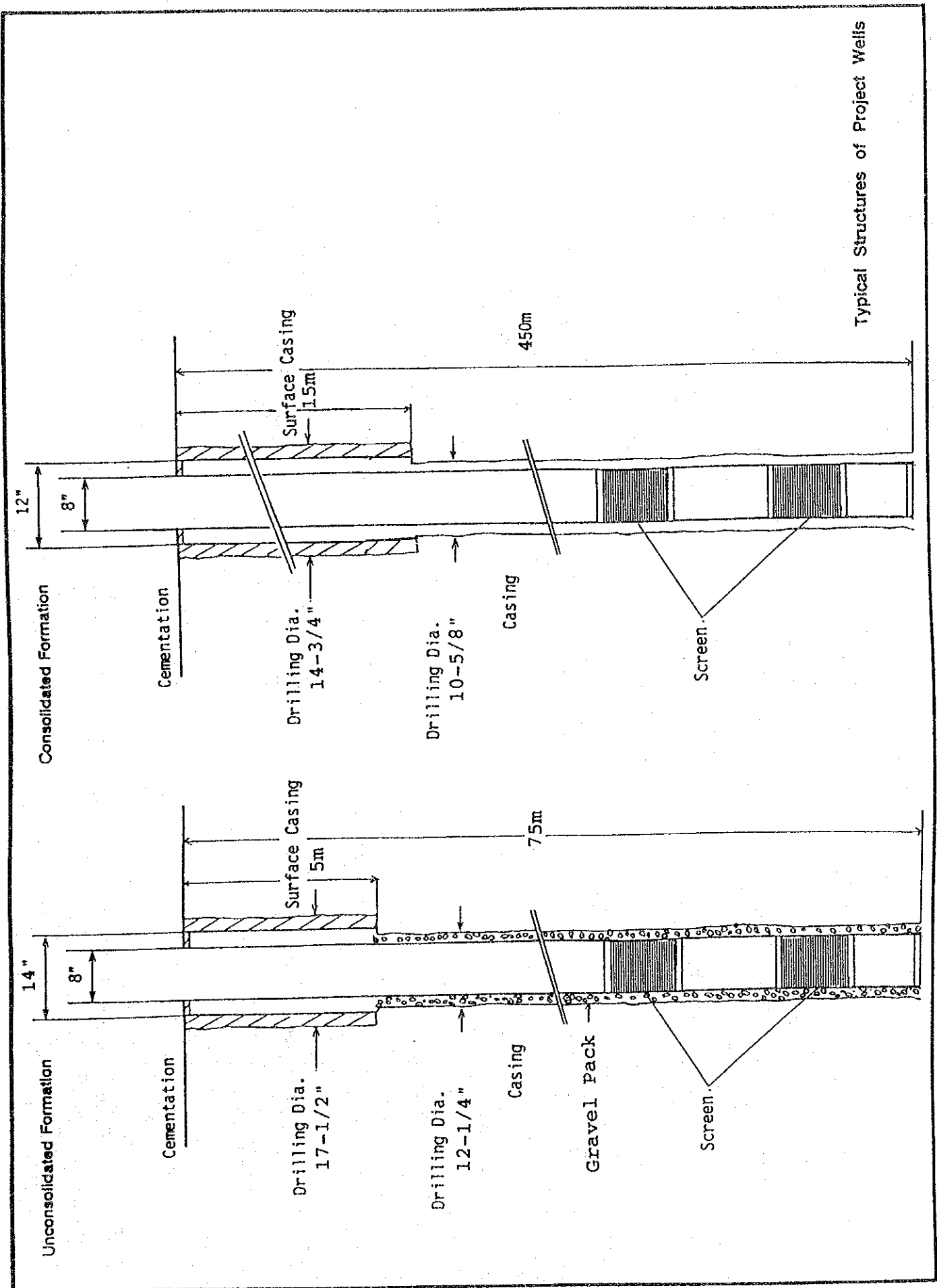
L E G E N D	
[Symbol]	Village
[Symbol]	Well
[Symbol]	Water Tank
[Symbol]	Pumping Main
[Symbol]	Distribution Line
P L A N	
[Symbol]	Pumping Main
[Symbol]	Distribution Line
[Symbol]	Well
[Symbol]	Water Tank
[Symbol]	Pumping Station
[Symbol]	Gate Valve
[Symbol]	Public Fountain

No.5:AS-SADARAH
 SITE PLAN

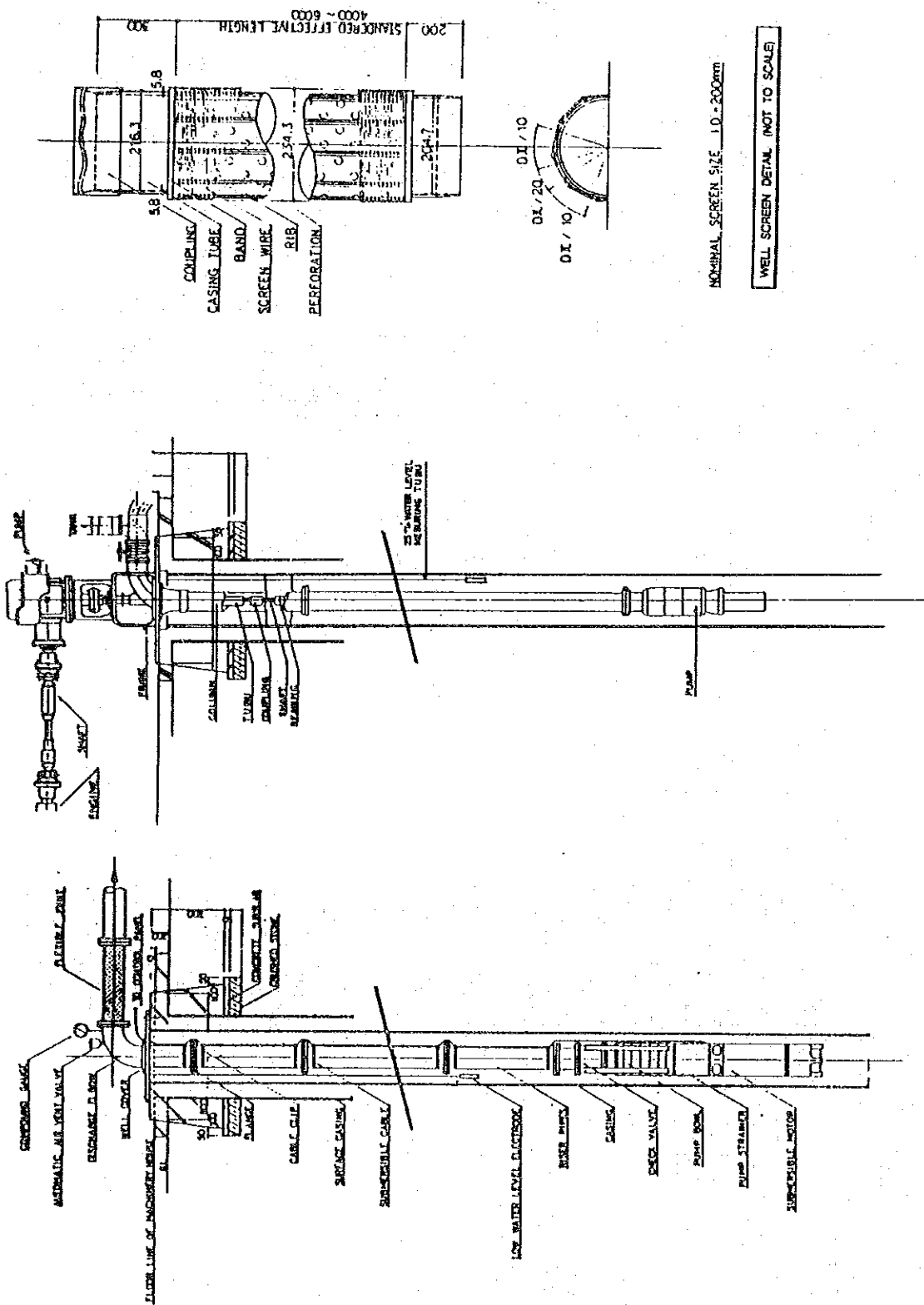


FLOW DIAGRAM
No.5:AS-SADARAH

B. DETAILS OF WATER SUPPLY FACILITIES



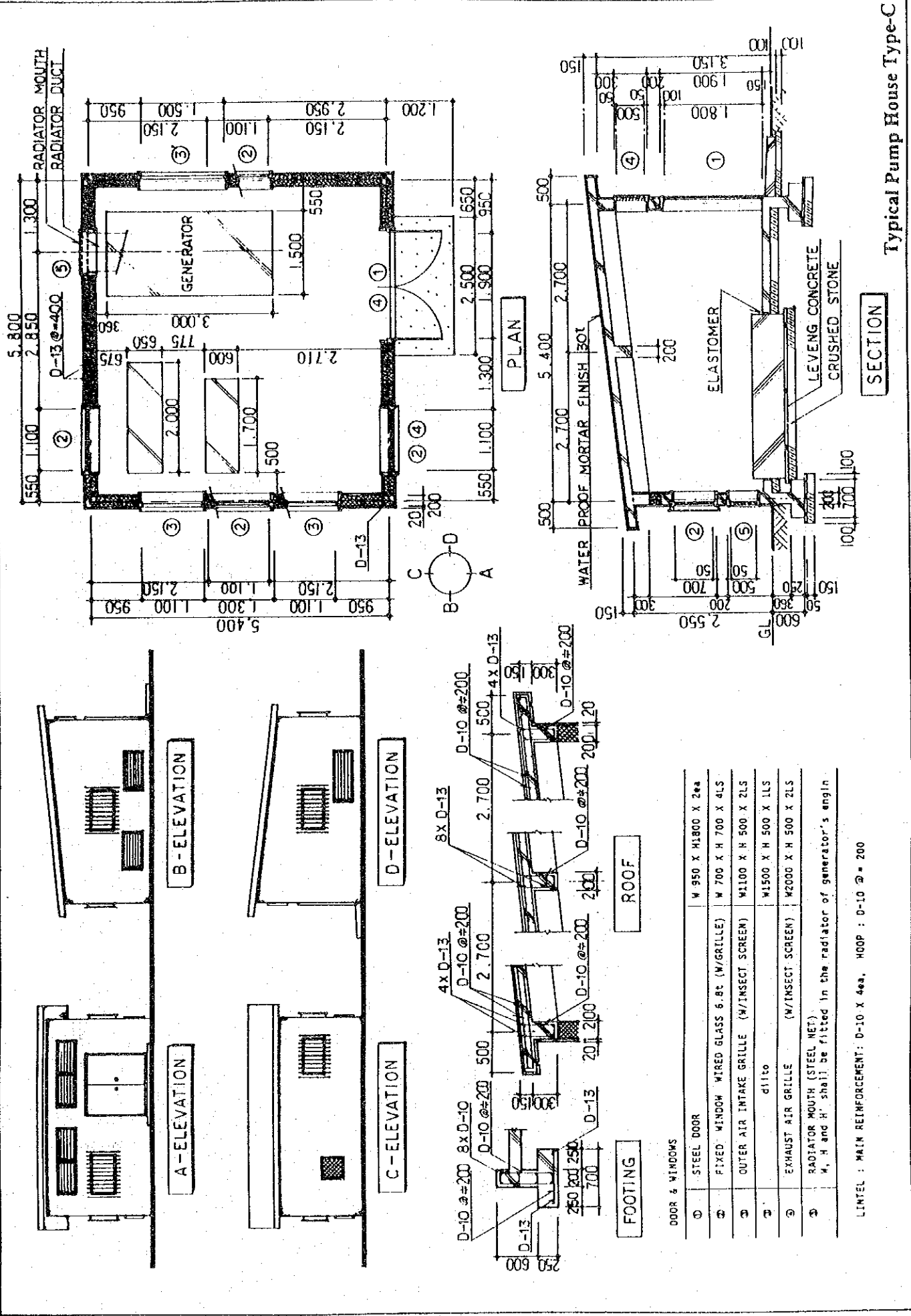
Typical Structures of Project Wells



DETAIL OF BORE HOLE PUMP INSTALLATION
(NOT TO SCALE)

DETAIL OF SUBMERSIBLE PUMP INSTALLATION
(NOT TO SCALE)

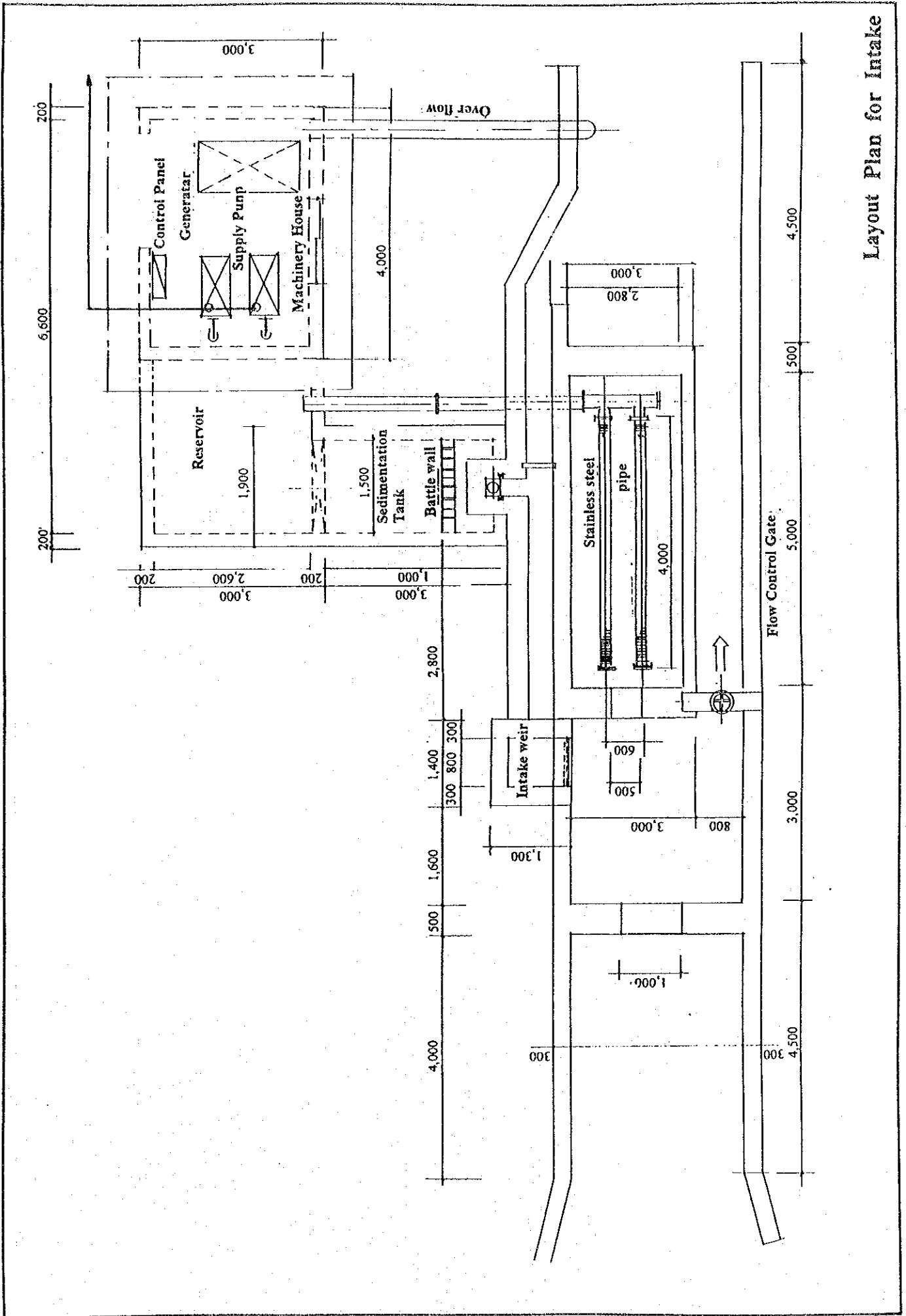
Typical Structures of Project Wells



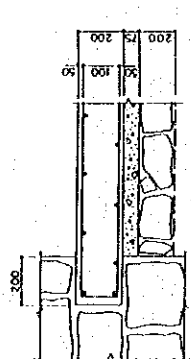
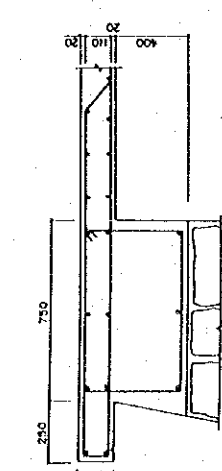
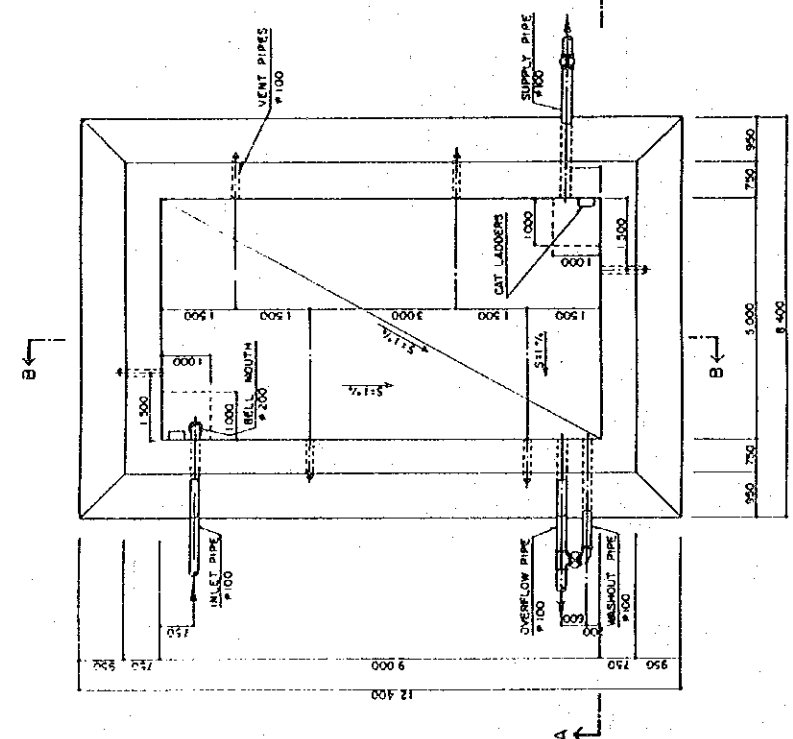
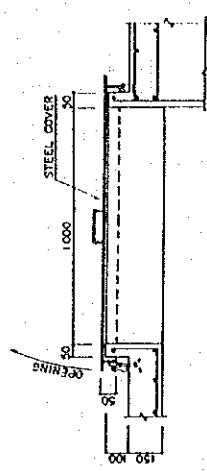
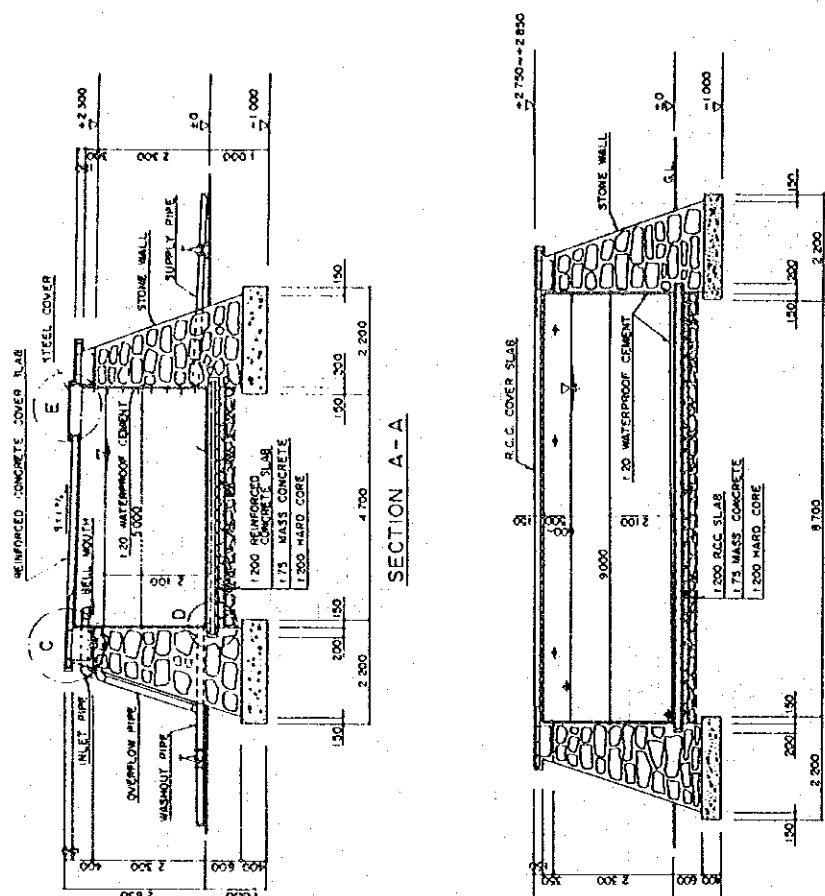
DOOR & WINDOWS

①	STEEL DOOR	W 950 X H 1800 X 2ea
②	FIXED WINDOW WIRED GLASS 6.8t (W/GRILLE)	W 700 X H 700 X 4LS
③	OUTER AIR INTAKE GRILLE (W/INSECT SCREEN)	W 1100 X H 500 X 2LS
④	dillo	W 1500 X H 500 X 1LS
⑤	EXHAUST AIR GRILLE (W/INSECT SCREEN)	W 2000 X H 500 X 2LS
⑥	RADIATOR MOUTH (STEEL NET) W, H and H' shall be fitted in the radiator of generator's engine	

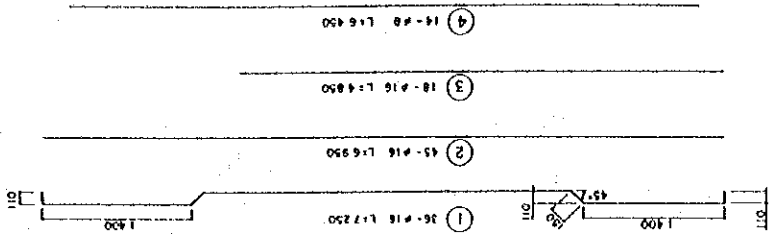
LINTEL : MAIN REINFORCEMENT: D-10 X 4ea, MOOP : D-10 @ 200



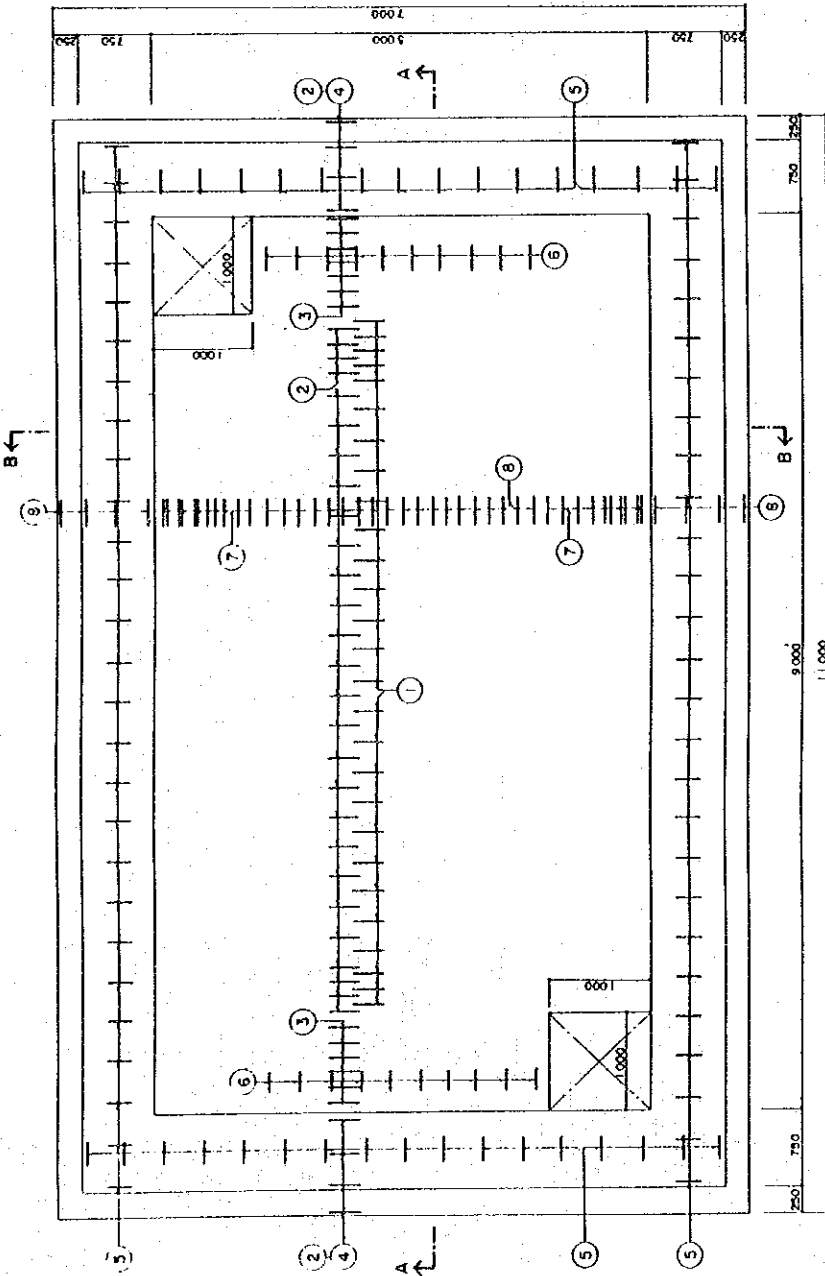
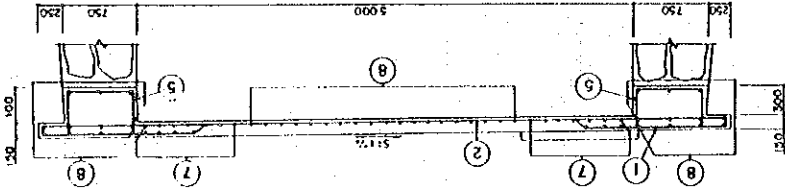
Layout Plan for Intake



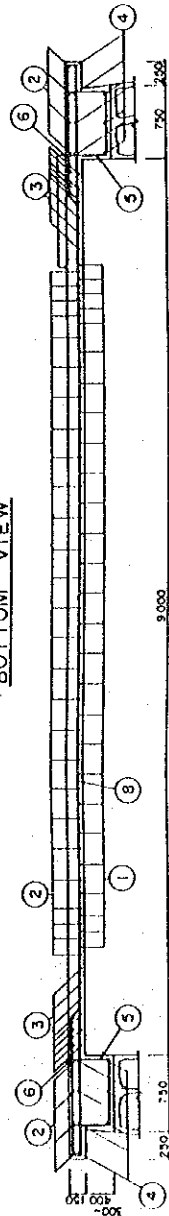
Layout Plan for Water Tank : 100m³



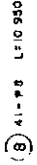
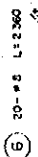
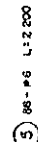
SECTION B - B

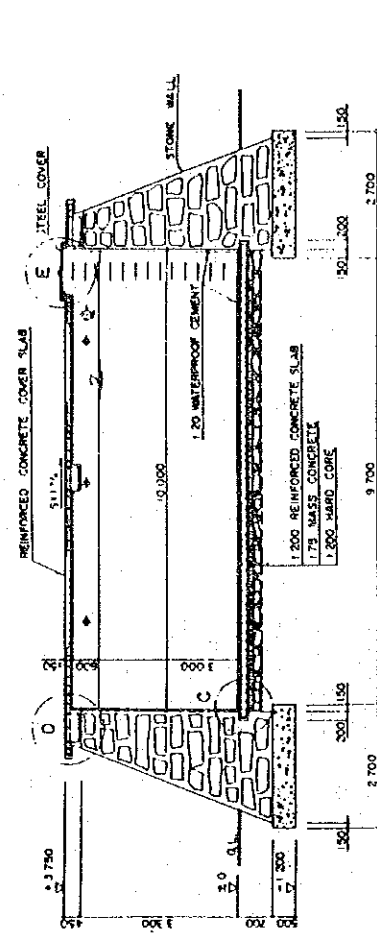


BOTTOM VIEW

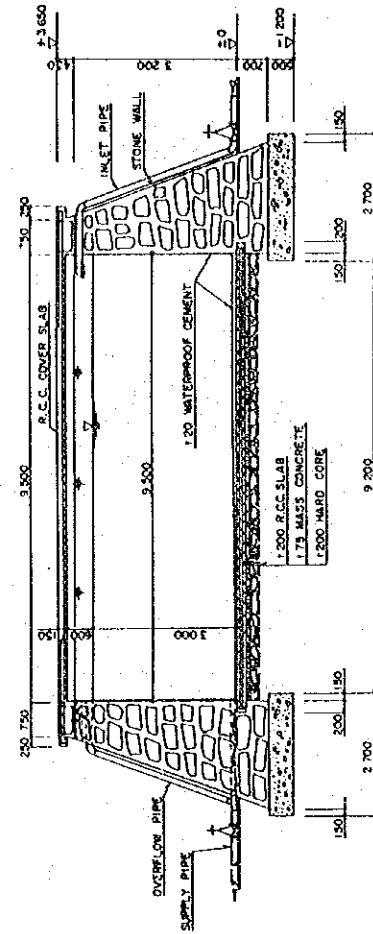


SECTION A - A

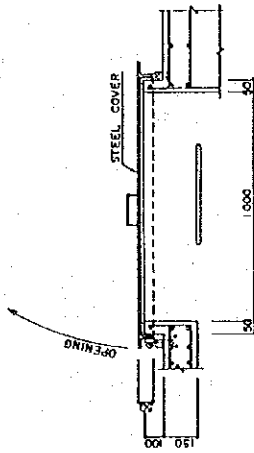




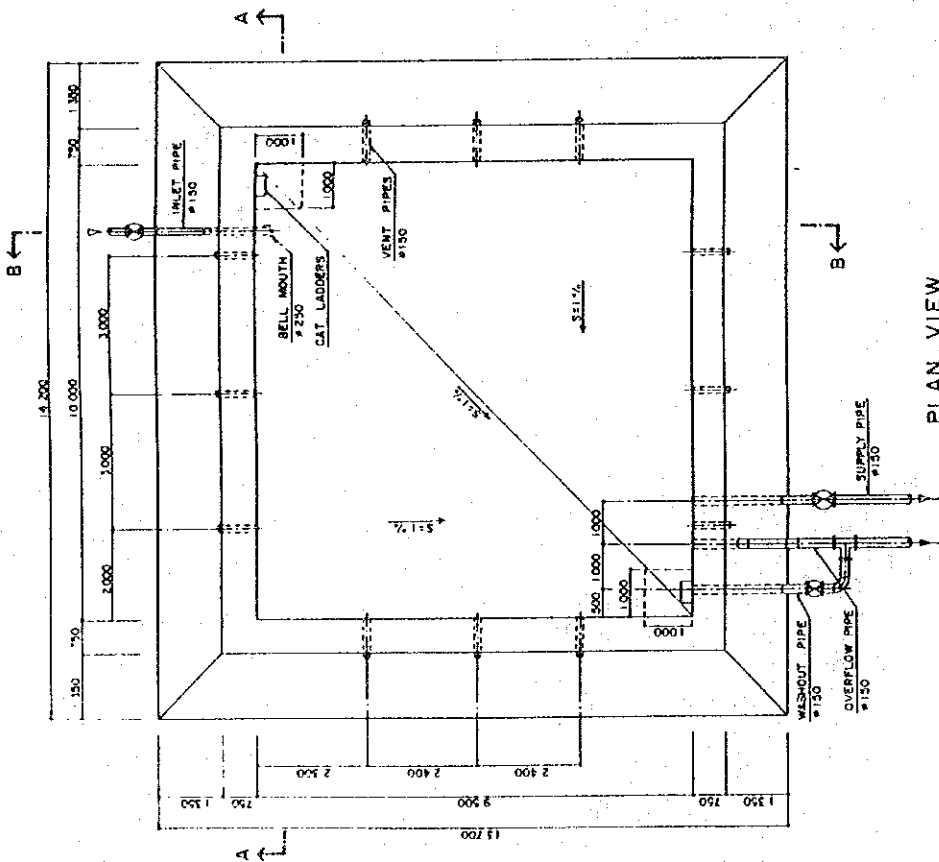
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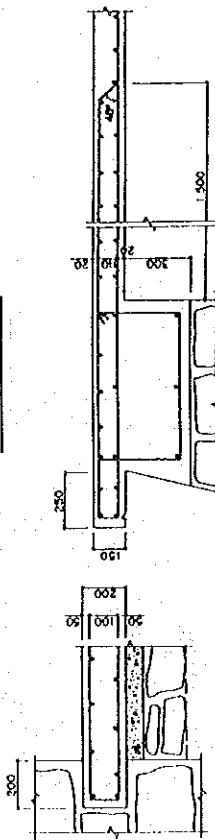
SECTION B-B



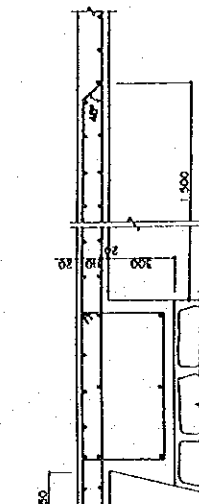
DETAIL E
MANHOLE COVER



PLAN VIEW

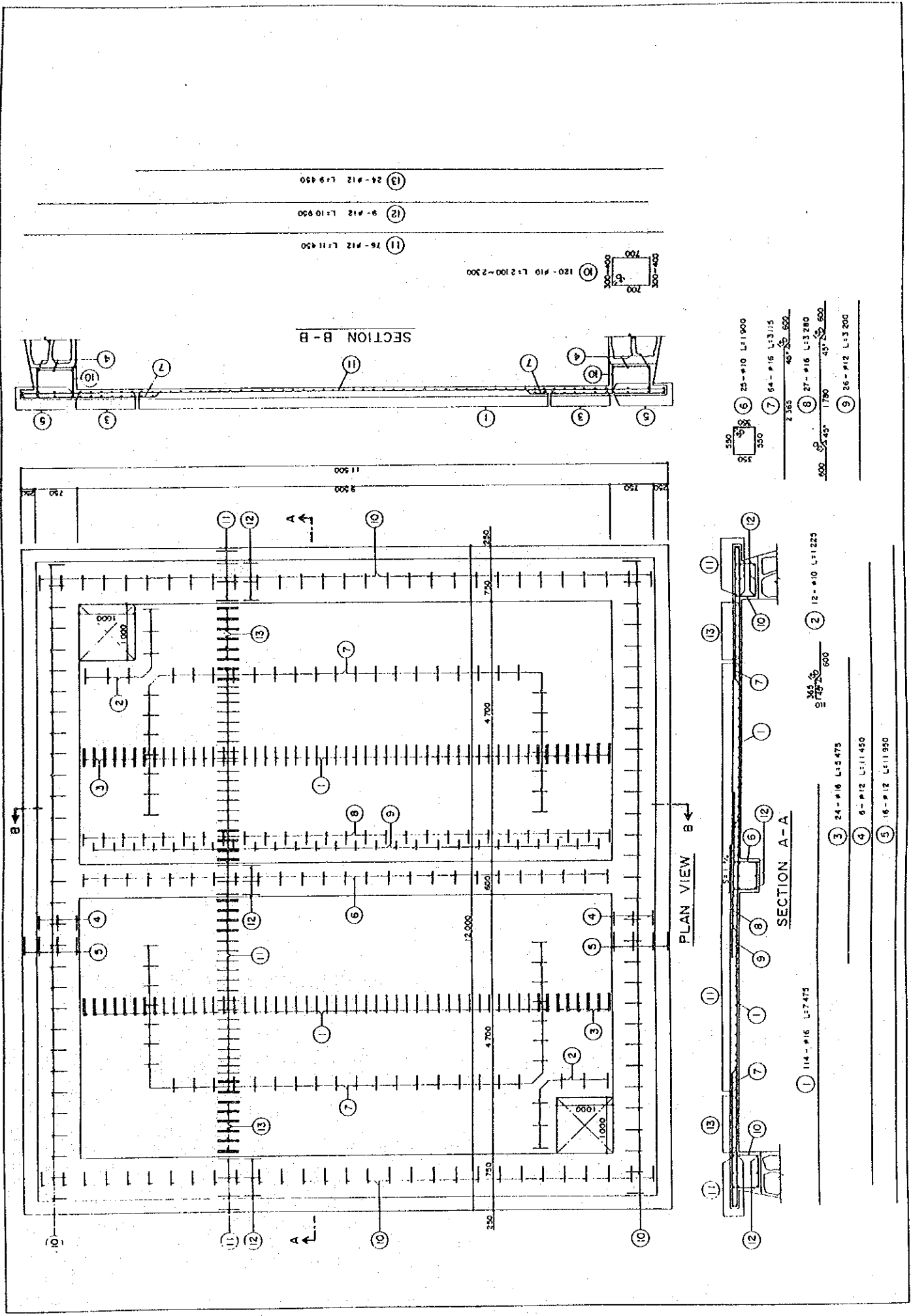


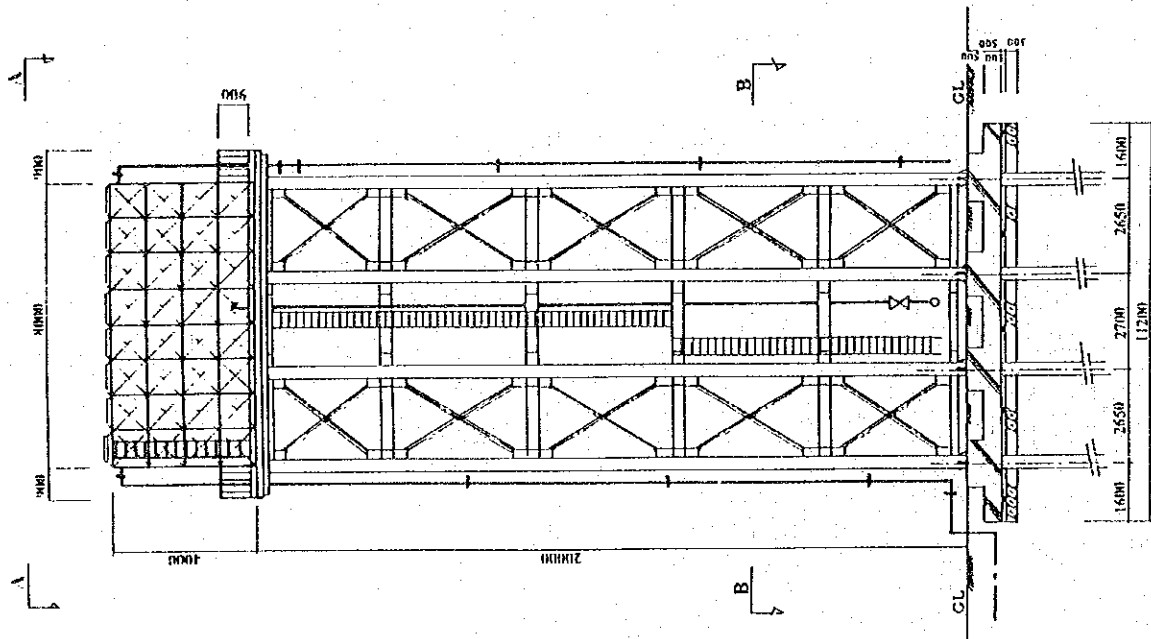
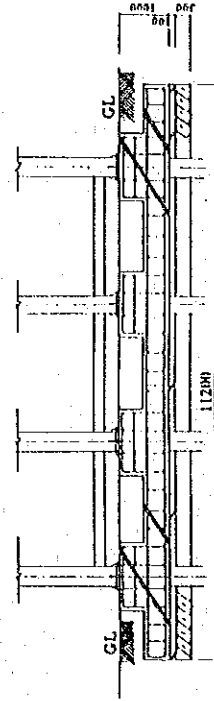
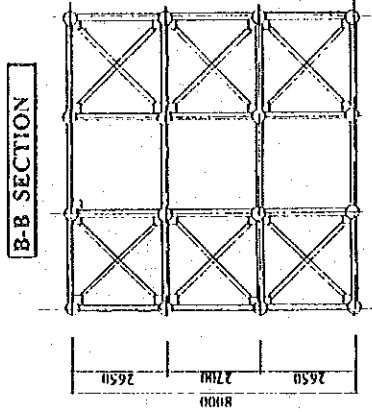
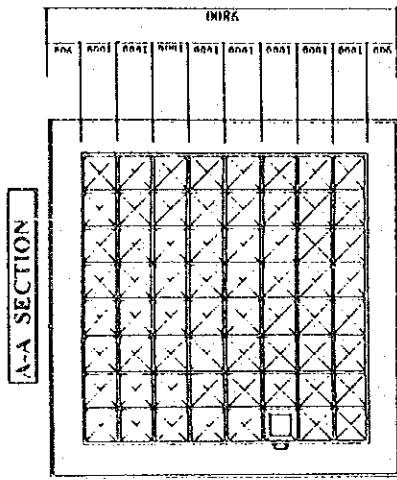
DETAIL C
R.C.C. SLAB



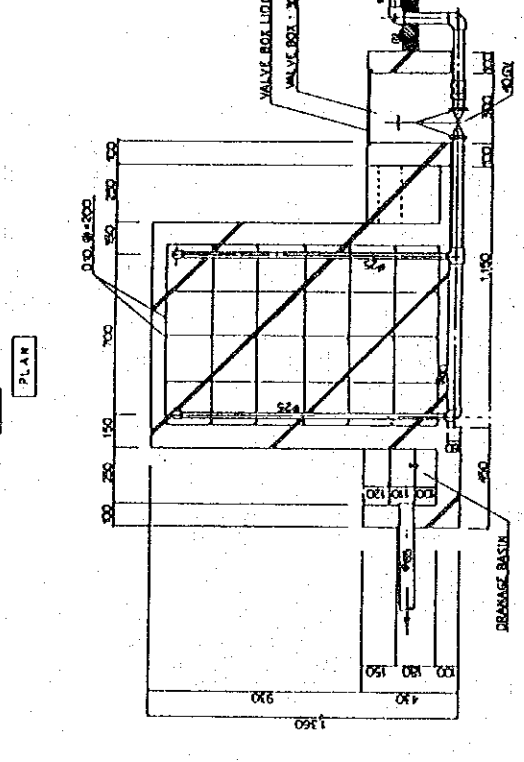
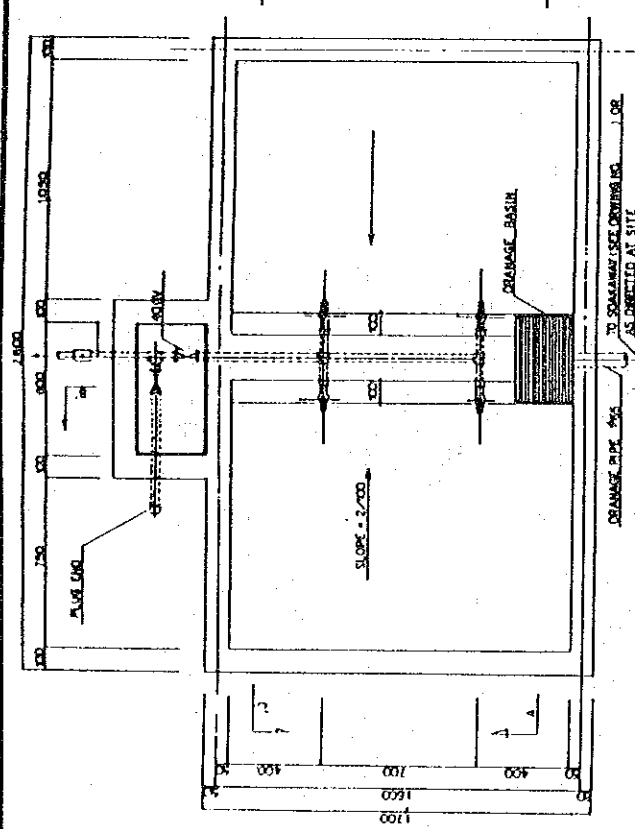
DETAIL D
R.C.C. COVER SLAB

Layout Plan for Water Tank : 300m3

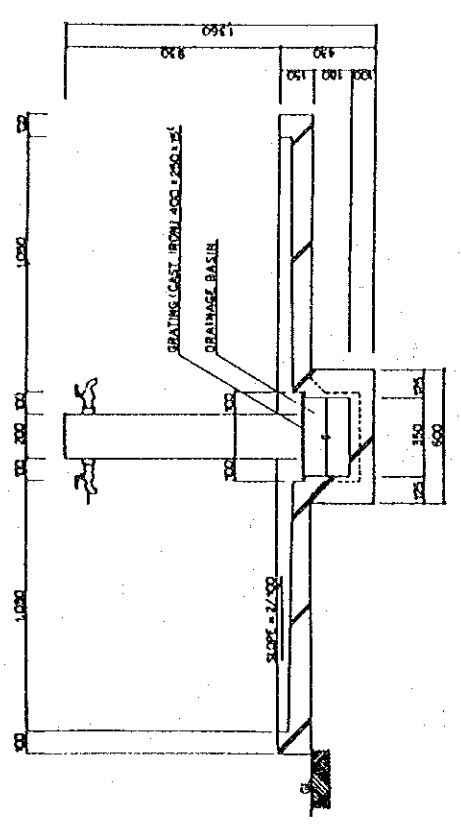




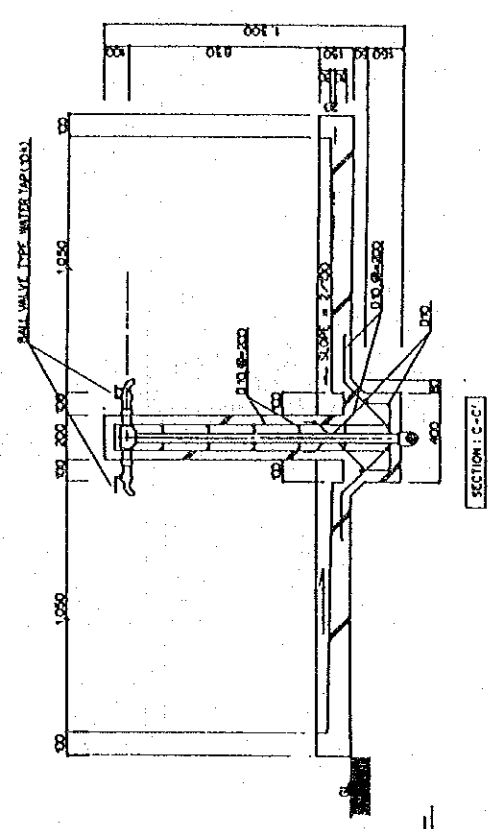
Layout Plan for Elevated Tank : 250m³



SECTION B-B



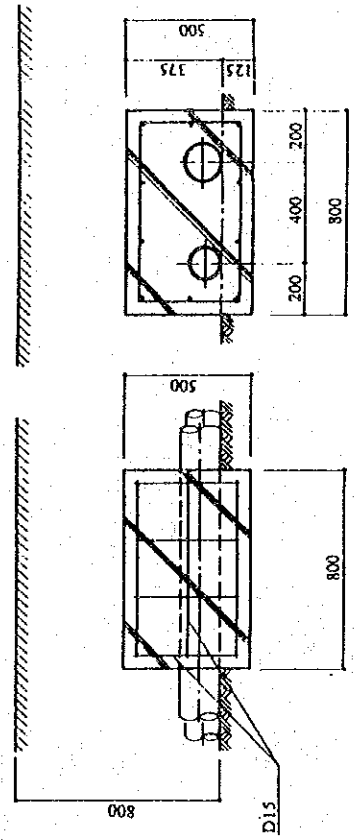
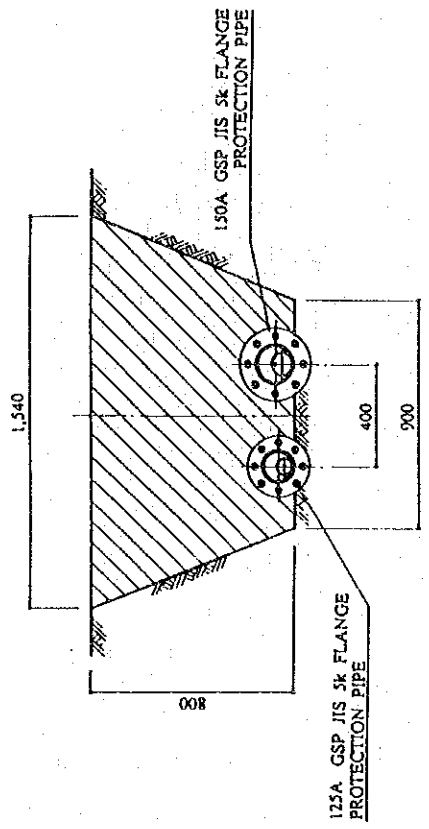
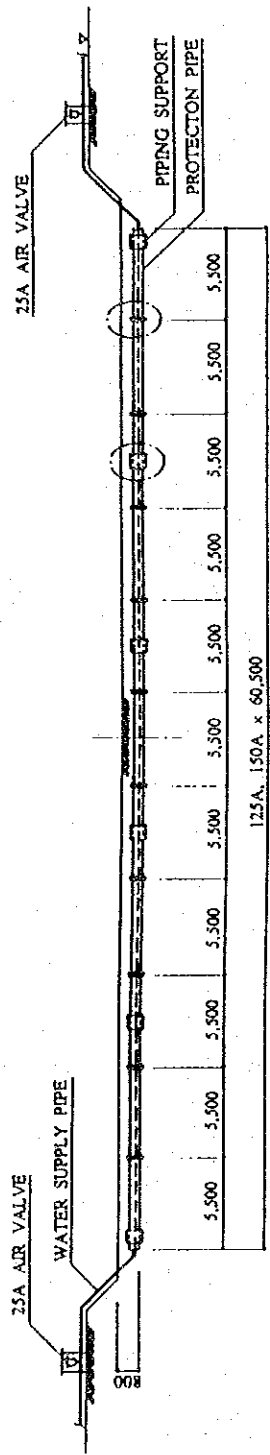
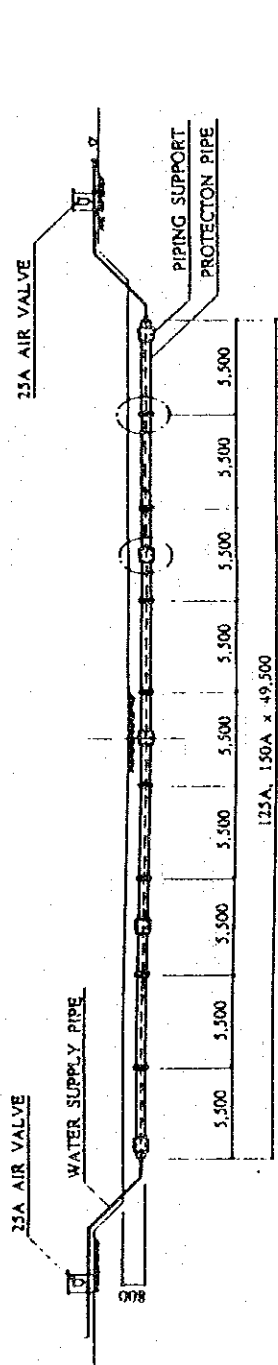
SECTION A-A



SECTION C-C

DETAIL OF TAP PUBLIC FOUNTAIN

Public Fountain 4-Tap



Pipeline Protection for
Wadi Crossing

SECTION B

SECTION A

JICA