3-2-5 Quality of Water

Table 3-3 and Fig. 3-10 show the water quality, mainly for electrical conductivity, on the water obtained from the water outcrop examined at the Project area.

Table 3-2 The Water Quality from the Water Outcrop.

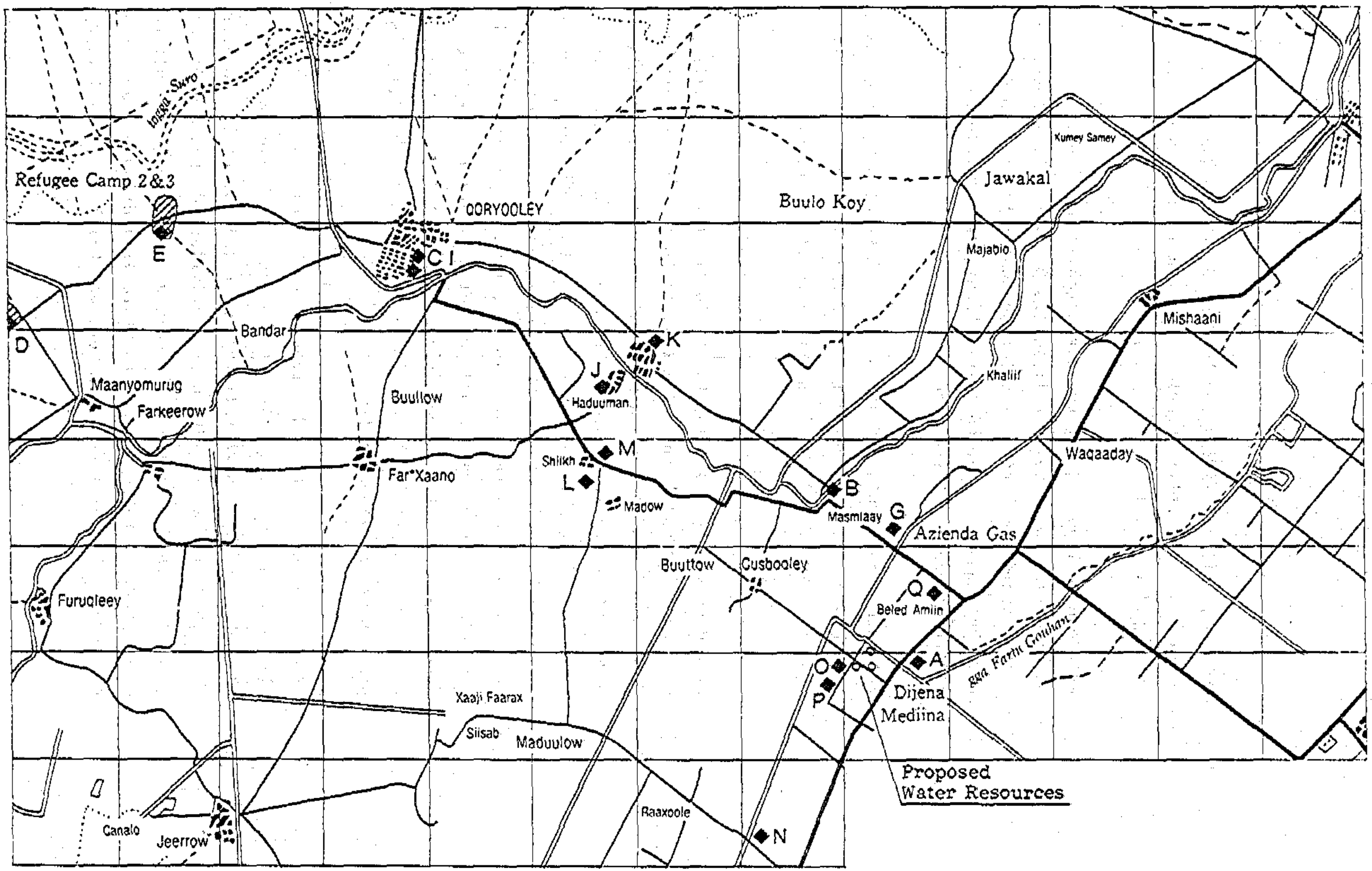
Water outcrop	Classification	Water temperature (C°)	PH	Electrical conductivity (μΩ /cm)
Surface Water	Rivers	29.0	7.0	1,000
	Reservoir	29.0	7.0	1,300
	Water Channel	29.0	6.5	920
	Drinking Water	28.0 - 29.0	7.0	1,600 - 1,750
Ground Water	Deep well	28.0 - 29.0	7.0 - 7.5	1,420 - 2,900
	Dhallow well	27.0 - 30.0	7.0 - 8.0	2,400 - 8,000

In the case of surface water, temperature is 29°C, pH is 6.5-7.0 and electrical conductivity is 920-1,300 μΩ/cm. On groundwater, water temperature is 27°C-30°C, pH is 7.0-8.0, and electrical conductivity is 1,420-8,000 μΩ/cm.

Compared to the surface water, the electrical conductivity of the groundwater is larger. The shallow wells have a larger electrical conductivity when compared with the deep wells.

When this survey was conducted, the water quality of a number of deep wells could not be examined, because the wells were not operating due to the high discharge of the Shabelle River.

Fig. 3-10 Location of Water Analysis Samples



However, Faillace (1964) and Macdonald (1978) measured the electrical conductivities of the presently used wells, and published reports.

As shown in Figure 3-11, the electrical conductivity of the groundwater around Beled Amin is 1,800 µΩ/cm, the lowest. The closer the distribution of the groundwater becomes to Qoryooley and Shalambood from Beled Amin, the higher the water's electrical conductivity becomes.

For reference, Table 3-4 shows the results of a water quality analysis of the deep wells in Beled Amin and Shalambood, the Shabelle River, and the drinking water of Qoryooley and the Refugee Camp 2.

According to the analysis, the salinity of the deep wells is between 1,300 and 1,950 µΩ/cm that is lower than the Drinking Water Standards determined by the Government of the Somali Democratic Republic. Though the total hardness ($CaCo_3$) is comparatively high, the stratum of the Lower Shabelle consists of deposits carried by the Shabelle River. During the period when the river's water level is low, fine granules (clay, silt) accumulate on the small shoals to form irregular clay layers. These layers of clay often include gypsum or other saliferous elements. Naturally the ground water generated through this process has a high salinity.

From the present data and survey on the water quality it is clear that the water quality of the Lower Shabelle is characterized by a high salinity and total hardness. However, the groundwater at the depth of the irrigated area around Beled Amin has been recharging well because of the long agricultural development history in the area where irrigation channels and the deep wells for irrigation were established. Such developmental processes raised the groundwater level and lowered the salinity. In fact, the salinity there is lower than the Somalia's drinking water standard though the total hardness is still high.

The deep and shallow groundwater (deep and shallow wells), except that in the irrigated area around Beled Amin, has too high a salinity to be appropriate for drinking water.

Table 3-3 Measurement of Water Quality

No.	Location	Kind of water	Water Temperature(°C)	Specific Conductivity at 25°C,(μΩ/cm)	PH
A	Dijene	Shallow well	29.0	2,400	7.0
B	Moshalaay	Shabeelle River	28.0	1,000	7.0
C	Qoryooley	Drinking water	29.0	1,600	7.0
D	Refugee Camp 1	Drinking water	28.0	1,650	7.0
E	Refugee Camp 3	Drinking water	28.0	1,750	7.0
F	Shalaambood	Deep well	32.0	2,400	7.0
G	Azienda GAAS	Shallow well	27.0	4,900	7.5
H	Marca	Shallow well	27.0	3,450	8.0
I	Qoryoley	Water Reservoir	29.0	1,300	7.0
J	Haduuman	Shallow well	30.0	3,000	7.5
K	Gaaywarrow	Shallow well	30.0	6,500	8.0
L	Bule Sheekh	Shallow well	30.0	8,000	8.0
M	Bule Sheekh	Canal	29.0	920	6.5
N	Deg Jannaay	Deep well	28.0	2,900	7.5
O	Beled Amin	Deep well(M41)	28.0 - 28.5	1,450 - 1,650	7.0 - 7.5
P	Beled Amin	Deep well(M38)	28.5 - 29.0	1,850 - 1,900	7.0 - 7.5
Q	Beled Amin	Shallow well	29.5	2,500	7.5

Fig. 3-11 Electric Conductivity

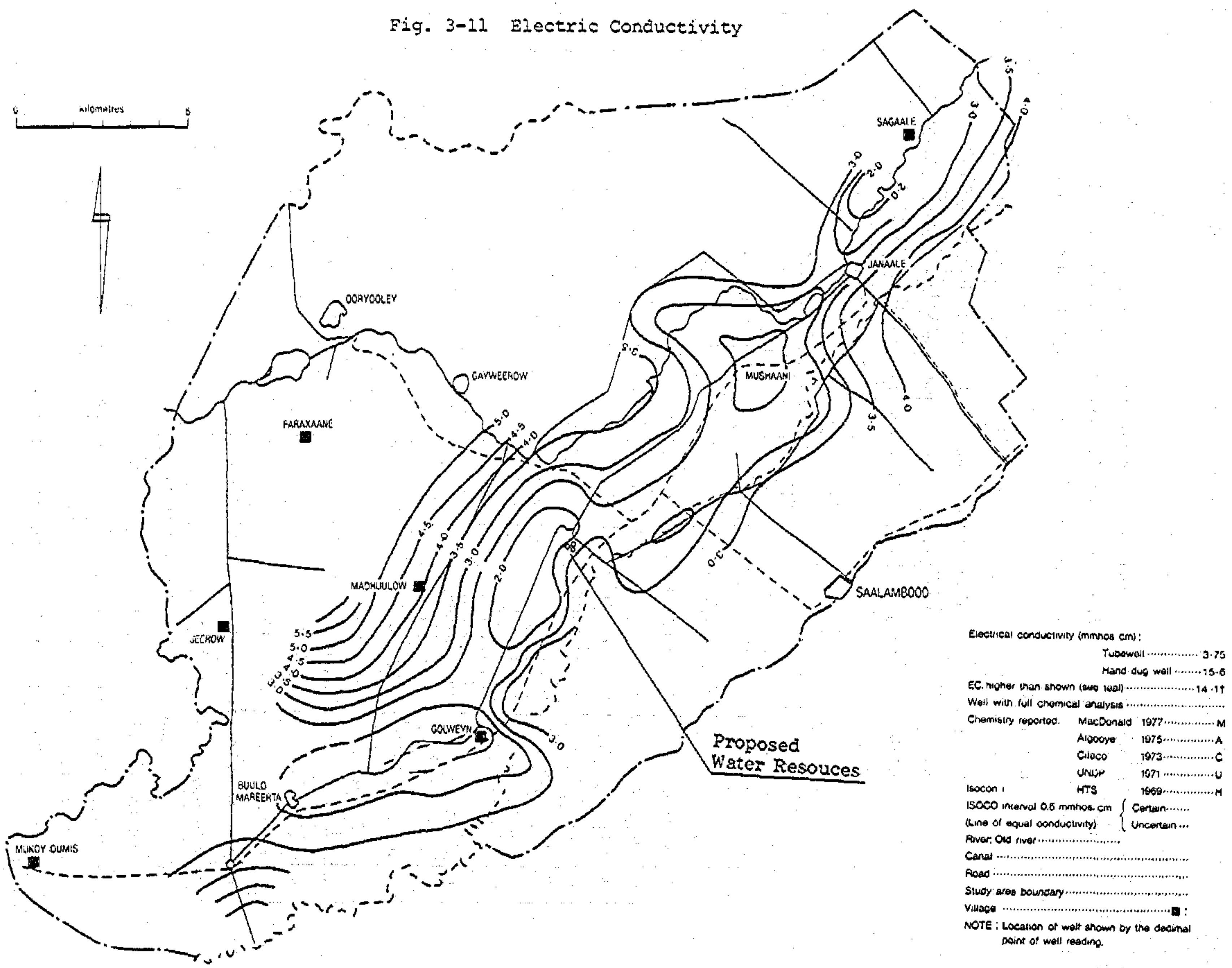


Table 3-4 The Result of Water Quality Analysis

	Ground water (M41)	Ground water (M38)	Shabelle River	SHALAM-bod	CAMP 2	Qoryoley Town	Unit
pH	7.14	7.14	7.16	7	7.2	7.15	
Na	56	71	23	272	25	24	mg/ℓ
K	7	7	5	4	6	7	"
Ca	288	298	131	186	160	282	"
Mg	81	88	40	113	37	37	"
Fe	0.1	0.15	0.11	Nil	Nil	0.11	"
Mn	0.15	1.0	0.16	Nil	Nil	Nil	"
Cℓ	142	178	57	213	105	105	"
SO_4	713	800	310	692	470	686	"
Ec	1,700	1,950	850	1,950	900	1,300	μΩ/cm
TDS	1,592	1,800	808	1,776	768	1,164	mg/ℓ
TH	1,056	1,112	496	936	552	856	"
HCO_3	362	362	193	435	121	145	"

3-2-6 Hydrological Characteristics

According to Faillace's data (1964), the excavation depth of present wells ranges from 60 to 225 meters with the majority from 80 to 95 meters.

The specific capacity*1 , (S.C.: $m^3/h/m$) to show capacity of wells, remains in the range of 1.0 - 65.6 $m^3/h/m$, with an average S.C., 15 $m^3/h/m$, and the maximum 65.6 $m^3/h/m$, as shown in the Annex-9 (MacDonald, data of 1978).

The Fig. 3-12 shows the distribution of specific capacity of the existing wells. The highest is shown at the Beled Amin Area with more than 20 $m^3/h/m$ of S.C.

The areas with at least 10 $m^3/h/m$ of S.C. has high water levels. These areas correspond to the areas with rapid water level increases.

The existing wells are reaching the layer of sand, gravel lying between 10-80 meters under the surface. The main component of this layer is gravel and pebbles to form a desirable groundwater aquifer. This may be confirmed by a high specific capacity and the transmission coefficiency*2 (average 222 m^2/day, maximum 759 m^2/day).

From the fact that the storage coefficient*3 (S) is in the order of 10^{-3} - 10^{-4}, it is also assumed that this gravel layer is confined aquifer.

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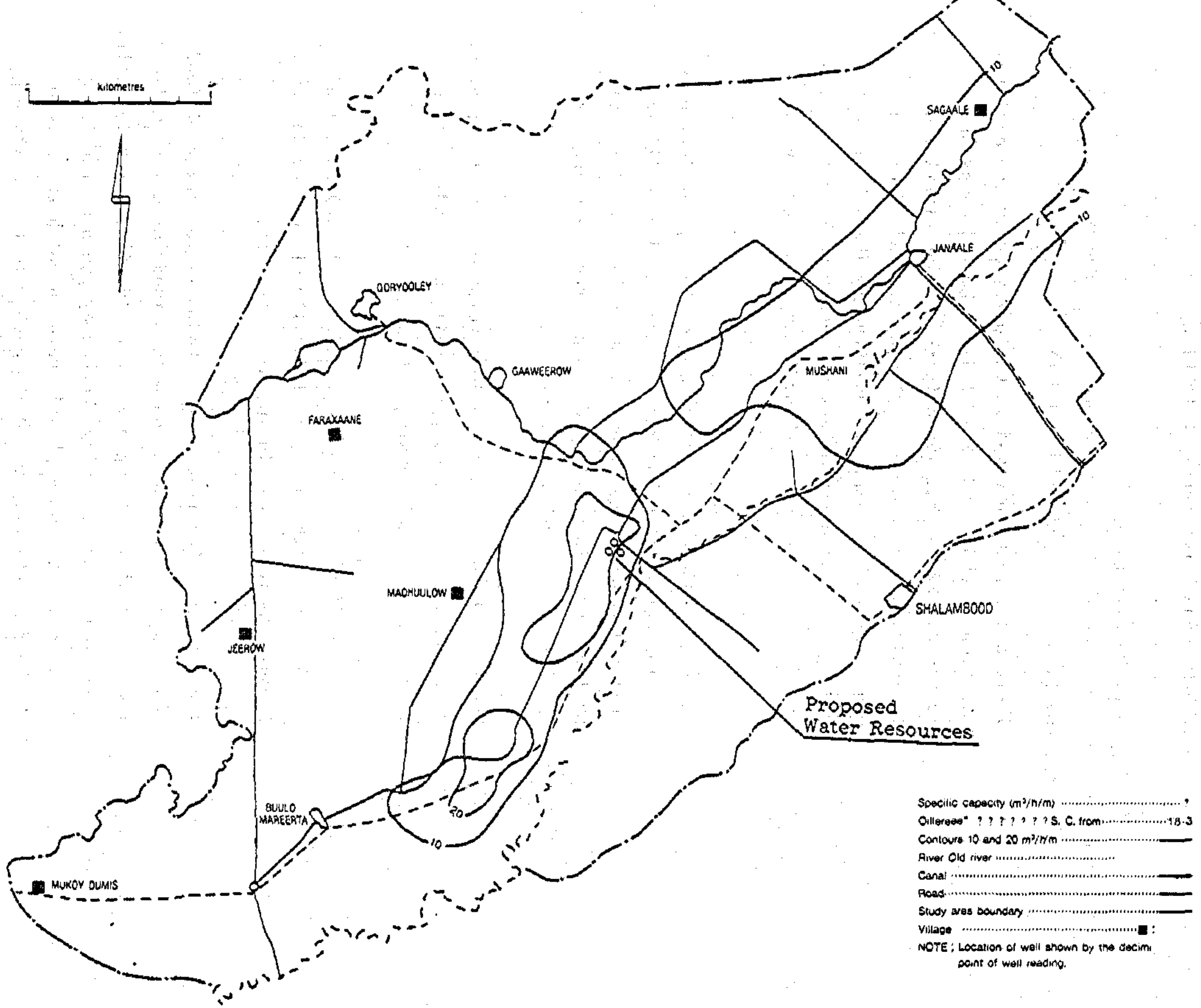
*1 Specific capacity (S.C.): The aquifiers yield to one water level unit lowering. The unit in general is m3/day/m.

*2 Transmissivity (T): The figure acquired by coefficient of permeability multiplied by the depth of the aquifier.

*3 Storativity (S): The quantity of water discharged from a area unit, according to the decrease in water head units that are perpendicular to the surface of the aquifer. In the case of unconfined water, the coefficient is equal to the effective opening of aquifer, and in the case of artesian water it means consolidation, and the value is 0.005 - 0.00005.

Fig. 3-12 Variation in Specific Capacity



3-3 Socio-economic and Water Supply Situation

3-3-1 Qoryooley Refugee Camps

(1) Outline

There are 3 refugee camps in Qoryooley under the administration of UNHCR and NRC. All of these 3 camps are used by the Somali who had lived in the Ogaden District of Ethiopia, and had sought asylum during and after the Ogaden War. The camps, established in 1977, have accommodated an increasing number of people peaking at 41,000 in 1981. An outline of those 3 camps is shown in Table 3-5.

As one of the refugee settlement policies, the Agriculture Development Program has been pushed ahead by utilizing fetile land and water from the Shabelle River for irrigation. Corn is cultivated and efforts are being made for the refugees to achieve self-help.

UNHCR has been providing various forms of assistance every year, such as water supply for daily use, medical care, education, food and housing. (Table 3-6)

As for medical care, each camp has (at least) one clinic and 4 to 8 health posts, periodically visited by doctors. A Danish medical team is in charge of this.

The Emergency Logistic Unit of UNHCR is in charge of food and is providing once a month such foods as maize, maize flour, lentils, cooking oil, powdered milk, sugar and salt. Food provisions are being checked by punching the number-of-month section on a plastic card on which the name of the head of the family and the number in the family are indicated. Each family has one plastic card delivered in advance each month.

As for education, most of the children are studying at one of the 5 classes in Camp 1 and 15 classes in Camp 2.

Clothing of refugees generally looks good, showing that the assistance of UNHCR and NRC is going smoothly.

Table 3-5 The Outline of Camp

	Camp 1	Camp 2	Camp 3
Established	1977	1977	1978
Land area km^2	139	136	136
Road	Existing	Existing	Existing
Bridge	-	-	-
Culvert			
Population	8,000	18,000	15,000
Family	1,831	2,411	2,653
Administrative Office	1	1	1
Community hall	1	1	1
Hospital	Hospital : 1 Clinic : 4	Hospital : 1 Clinic : 8	Hospital : 1 Clinic : 6
School (class)	5	15	-
Food warehouse	1	1	1
Post office	-	-	-
Police box	-	-	-
Bus station	-	-	-

Table 3-6 Foreign Economic Aid

(Unit : US$ million)

	1981	1982	1983	1984	1985
Financial assistance (estimated)	105	132	126	120	not identified
Contents					The plan is in force
Water supply	2	2	2	2	2
Medical treatment	3.5	3.5	3.5	3.2	3
Education	2.5	3	3.2	3	2.7
Food	90	96	94	90	94
House	1	2	0.5	0.2	0.5
Others	6	25.5	22.8	21.6	-

(2) Status of water supply

There are no wells in the camps. The water for daily use is drawn from the Shabelle River after the purification process. However, the water from the River is not available during the dry season from December to March when there is hardly any water flow. Therefore, a stable, year-round water supply is not possible. Despite the groundwater survey conducted near the camps by UNICEF in 1982, the project utilizing groundwater for water resources has been abandoned because of the high salinity found. Since then, several organizations and UNICEF studied the future expansion of the raw water storage reservoir and the water treatment system by combining a natural settling basin and slow sand filter. After the study, the water treatment system of Camp 2 was improved using this system.

But, there is a limit to this water treatment system due to the excessively high turbidity of the Shabelle River water. Other camps still depend on the Coagulo-sedimentation system by use of PAC Coagulant. During the dry season when the Shabelle River dries up, Camps are supplied by tank lorries carrying groundwater in from Shalambood.

Each camp's water supply facilities are outlined below.

Outline of Water Supply Facilities of 3 Camps	Table 3-7
Refugee Camps in Lower Shabelle	Fig. 3-13
Outline of Existing Water Supply Facilities of Camp 1	Fig. 3-14
" Camp 2	Fig. 3-15
" Camp 3	Fig. 3-16
Conception Drawings of Existing Water Facilities of 3 camps	Fig. 3-17

Administrated by 5 staff members including an expert (Dutch engineer), the facilities' maintenance staff includes the following; a foreman, 2 pump operators, 2 inspectors for Camp 1, 7 operators for Camp 2, 5 operators for Camp 3 and a machinery technician for Camps 2 and 3. The maintenance expenditures for 1984 were as follows.

Personnel expense	316,800 So.Sh		
Repairs	C1 13,200 So.Sh	+	400 US$
	C2 1,015,100 "	+	5,800 "
	C3 185,200 "	+	24,800 "
Cost of chemicals	Chlorine (700 kg)		2,000 US$
	Coagulant (8,000 liters)		4,400 US$
Fuel cost	Not confirmed, yet		
Total	1,620,300 So.Sh + 37,400 US$		

The expenditures are entirely financed by UNHCR.

Table 3-7 Outline of Water Supply Facilities for Refugee Camps

	Camp 1	Camp 2	Camp 3
Established	1981	1983	1983
Water Supply Capacity	$60m^3$/day (7.5ℓ/day/person)	90 m^3/day (5.0ℓ/day/person)	$80m^3$/day (5.3ℓ/day/person)
Water Served population	8,000 persons	18,000 persons	15,000 persons
Operating hour	6 a.m. - 6 p.m.	6 a.m. - 6 p.m.	6 a.m. - 6 p.m.
Raw Water Reservoir	3,500 m^3	5,000 m^3	3,500 m^3
Purification facilities	Chemical Purification Plant ø3.65m x ^{H}1.2m, 12.6 m^3 x 3plants	Slow Sand Filters ø6.0m x ^{H}3.55m x 2 plants, 28 m^3/plants	Chemical Purification Plant ø3.65m x ^{H}1.2m, 12.6m^3 x 5 plants
Clear Water Reservoir	Clear Water Reservoir ø3.65m x ^{H}1.2m, 12.6 m^3 x 2 reservoirs	Clear Water Reservoir ø6.0m x ^{H}2.0m x 2 reservoir, 50m^3/reservoir	Clear Water Reservoir ø5.1m x^{H}1.2m, 24.5m^3 x 2 reservoir
Water Filling facilities	2 public wacer filling stations (10 taps) and 1 donkey cart filling station	3 public water filling stations (10 taps) and 1 donkey cart filling station in camp 2A	2 public water filling stations (10 taps) and 1 donkey cart filling station

Fig. 3-13 Refugee Camps in Lower Shabelle (RWSD/SRWU)

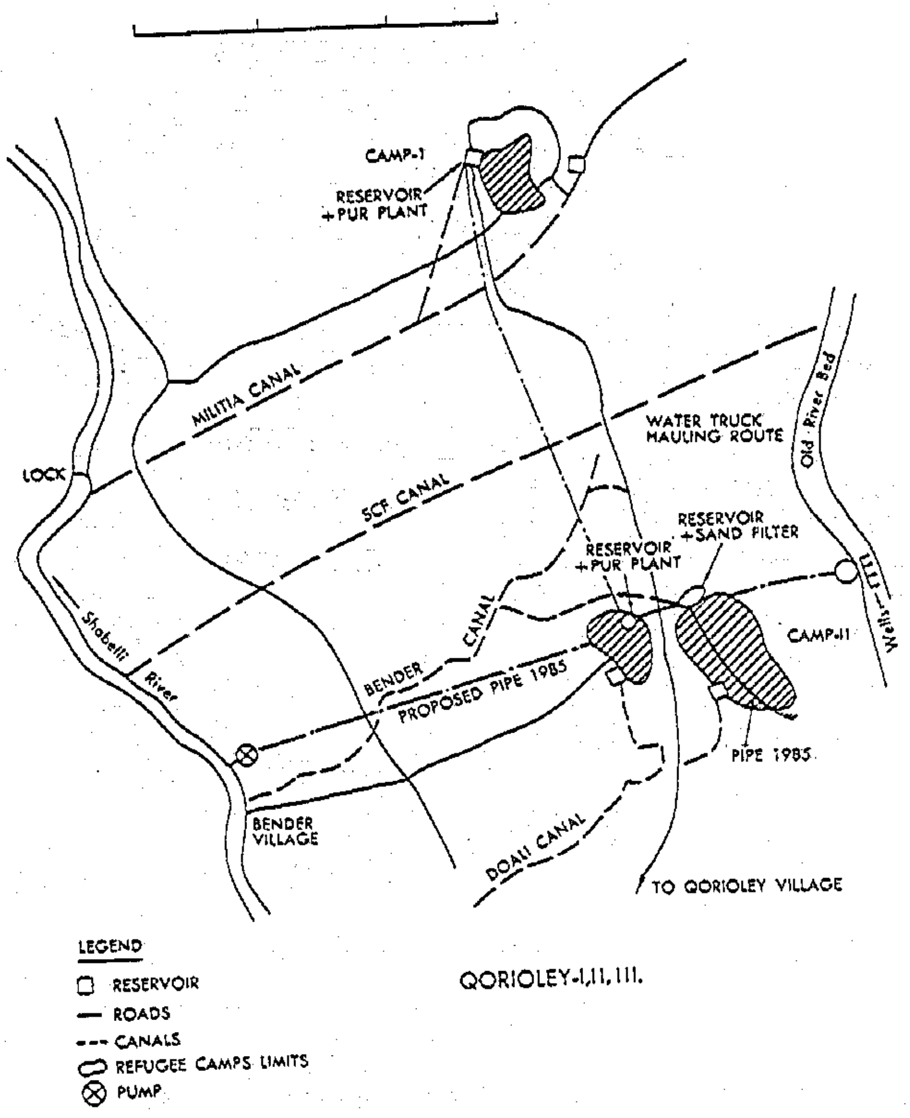


Fig. 3-14 Existing Water Supply Facilities of Camp 1

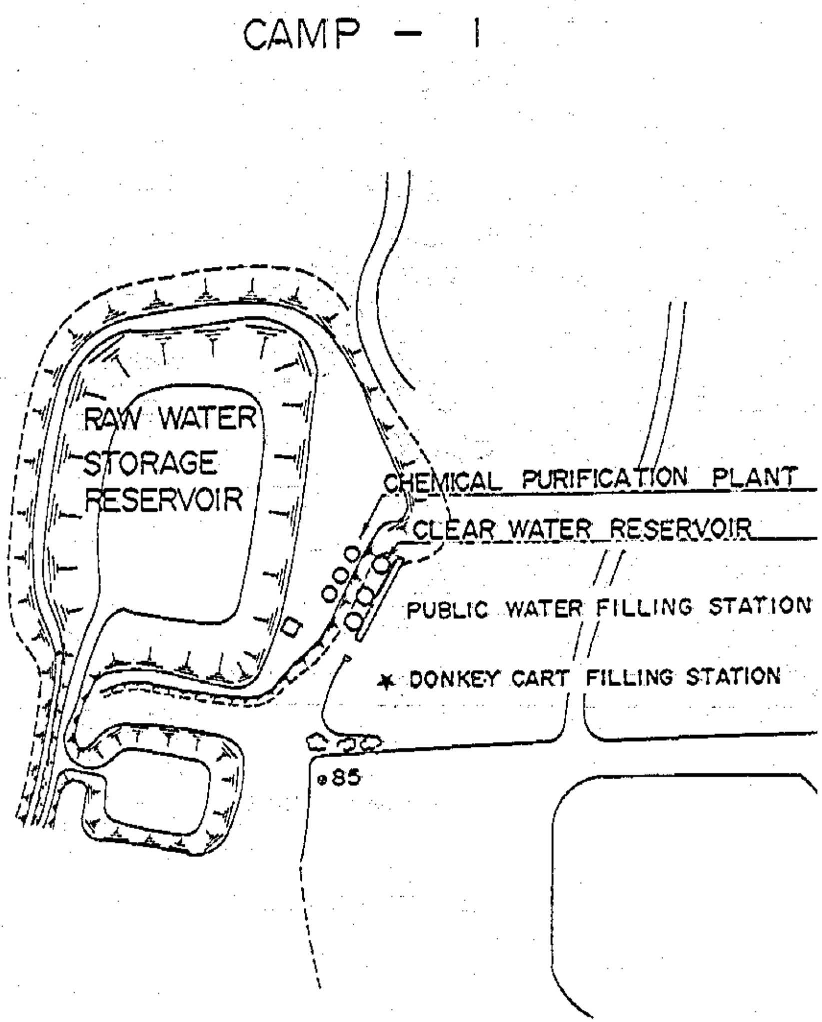


Fig. 3-15 Existing Water Supply Facilities of Camp 2

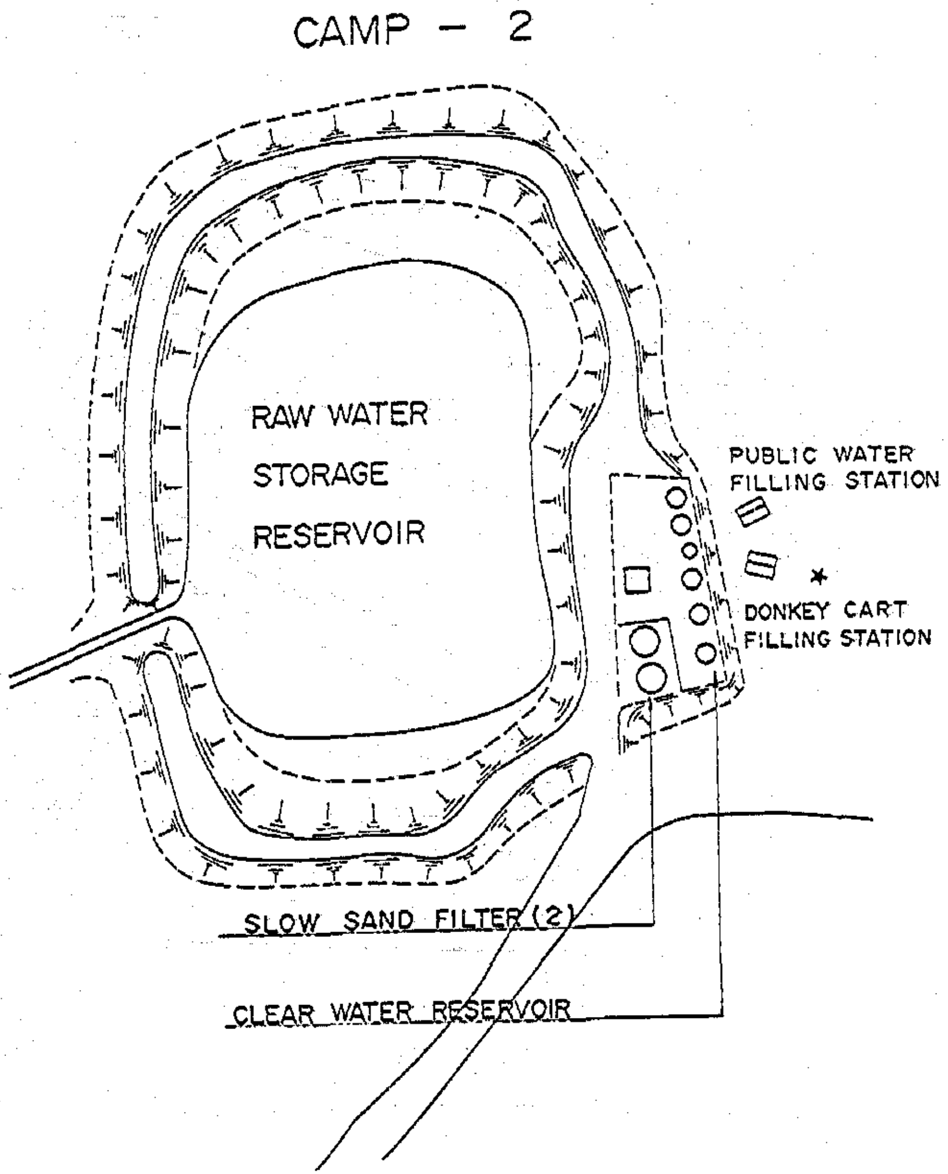


Fig. 3-16 Existing Water Supply Facilities of Camp 3

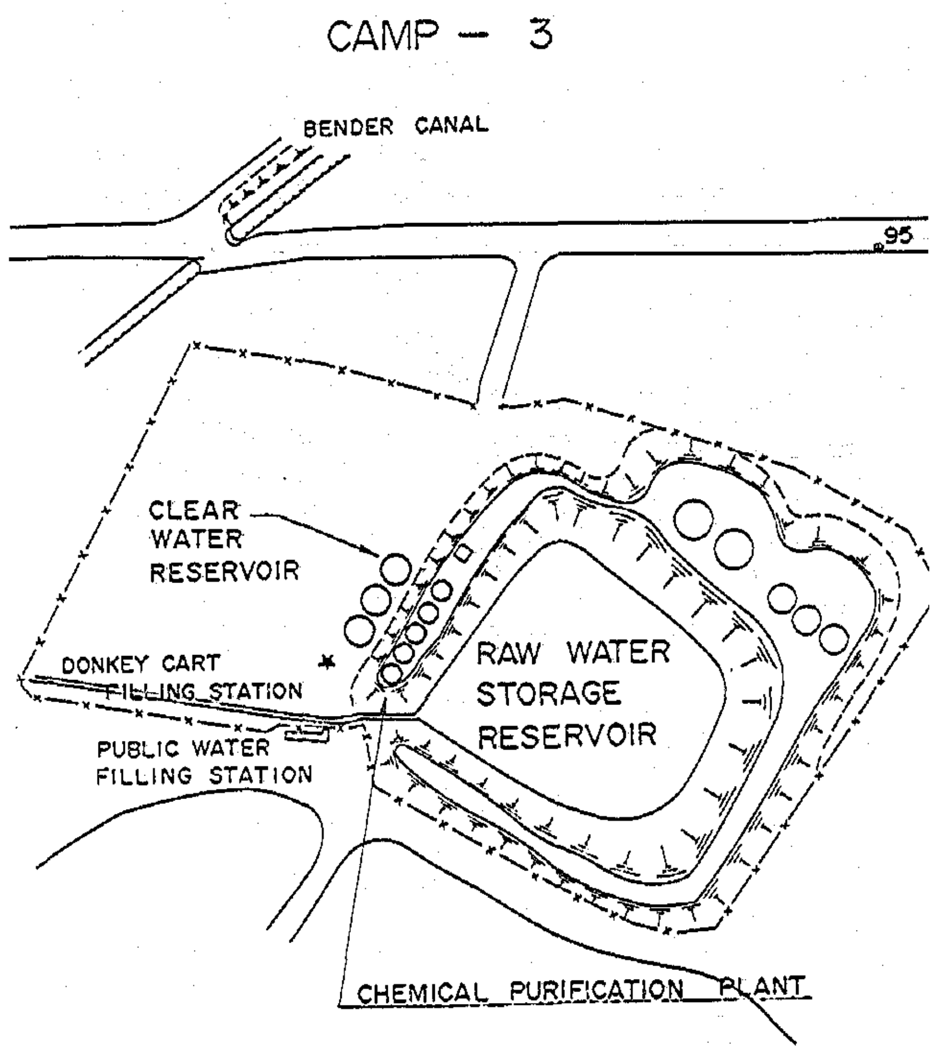
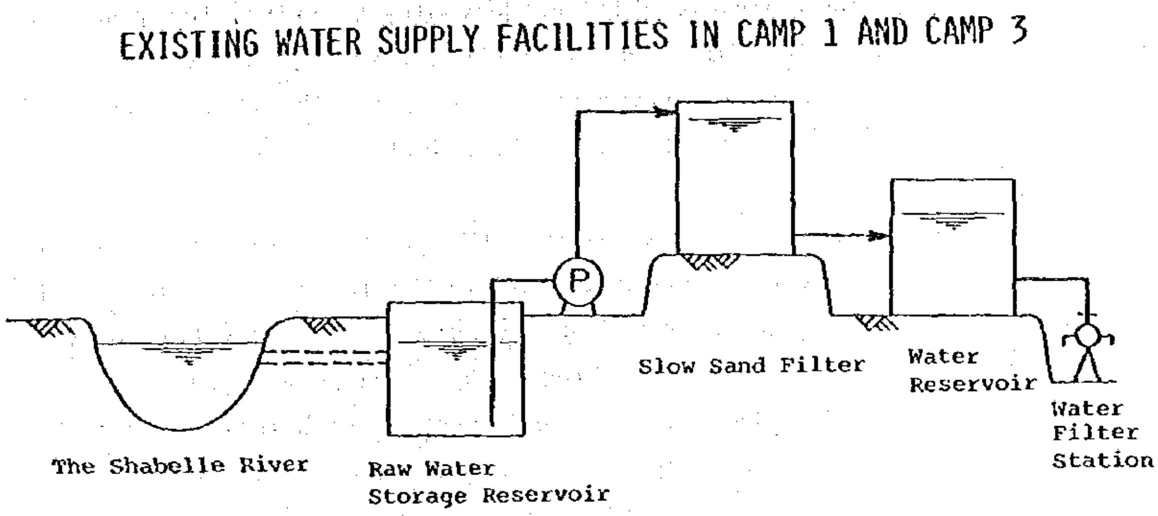
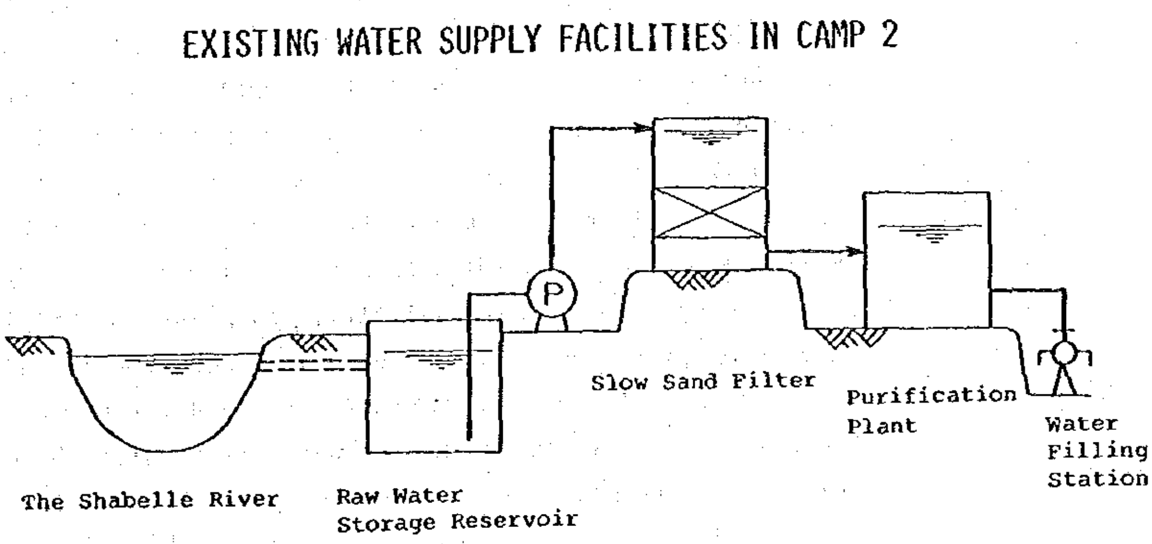


Fig. 3-17 Concept Drawings of Existing Water Supply Facilities of Refugee Camps





3-3-2 Area Surrounding the Refugee Camps

(1) Outline

The area surrounding the refugee camps is located around Qoryooley Town in the Qoryooley District, Lower Shabelle Region, with land suitable for irrigation agriculture and livestock farming benefiting from the water of the Shabelle River, one of the two big rivers in the nation.

The area has a relatively large population including permanent residents and nomads. The total population of the 20 villages surrounding the refugee camps and Qoryooley Town is 110,530. The breakdown of the population is shown in Table 3-8. The villages contain rich foliage throughout the year except during the dry season from December to March. During the dry season even the Shabelle River occasionally dries up, therefore, not only livestock water but drinking water for people becomes short. In Qoryooley Town, there are water supply facilities utilizing the water of the Shabelle River, as described later. However, the water supply facilities are working intermittently at present because the water flow of the Shabelle River becomes extremely small in the dry season. The water for daily use in the villages around the Camps is entirely dependent on the Shabelle River, because the groundwater from shallow wells as well as deep wells is not at all usable for drinking water due to its high salinity. To maintain a minimum amount of daily water during the dry season, the groundwater from Shalambood and Merca is provided for the area's inhabitants. For livestock, the water is acquired by digging the dried river bed. Under the present situation, it is becoming even more necessary to satisfy the infrastructure of water supply facilities to secure a stable and year-round supply of safe and clean water so as to create a proper environment for health and sanitation to arrest the settlement of the refugees as well as the nomads in the area.

Table 3-8 Population of Camps and Surrounding Villages

		(A)		(B)		Standard population (1984)
		Number of houses	population	Number of houses	population	
Direct Water Supply Area	Beled Amin	28	280			280
	Dijena	45	500			500
	Mediina	70	225			230
	Azienda Goas	150	380			380
	Urugle	38	115			120
	Musharai	18	30			30
	Bullow Cusbooley	300	2,000			2,000
	Dhanada	45	270			270
	Bule Sheekh	375	2,300			2,300
	Haduuman	400	3,023	1,400	6,980	3,020
	Gaywarrow	855	9,000	157	7,740	9,000
	Qoryoley			3,500	25,630	25,630
					Sub Total	43,760
	Camp 1					8,000
	Camp 2					18,000
	Camp 3					15,000
					Sub Total	41,000
					Total	84,760
Indirect Water Supply Area	Jasiina	223	1,161			1,160
	Farxaan	1,523	11,200	1,200	10,823	11,200
	Dharqanley	30	250			250
	Bandar	150	2,007	171	3,854	2,010
	Maanyofarax	400	2,480	530	4,530	2,480
	Farkeero	74	150			150
	Goygaal	600	3,200	260	5,240	3,200
	Aranoy	350	1,000			1,000
	Cabdi Cali	496	4,321	530	6,730	4,320
					Total	25,770
					Grand Total	110,530

(A) This Field Survey

(B) Medical Office Survey (1984)

Beled Amin and its surrounding areas, which are expected to serve as the water resource of the Project, enjoy an abundant supply of good quality groundwater. In these areas, the fruit farms, like bananas, are developed by utilizing the groundwater during the dry season and the Shabelle River water during the rainy season.

(2) *Infrastructure*

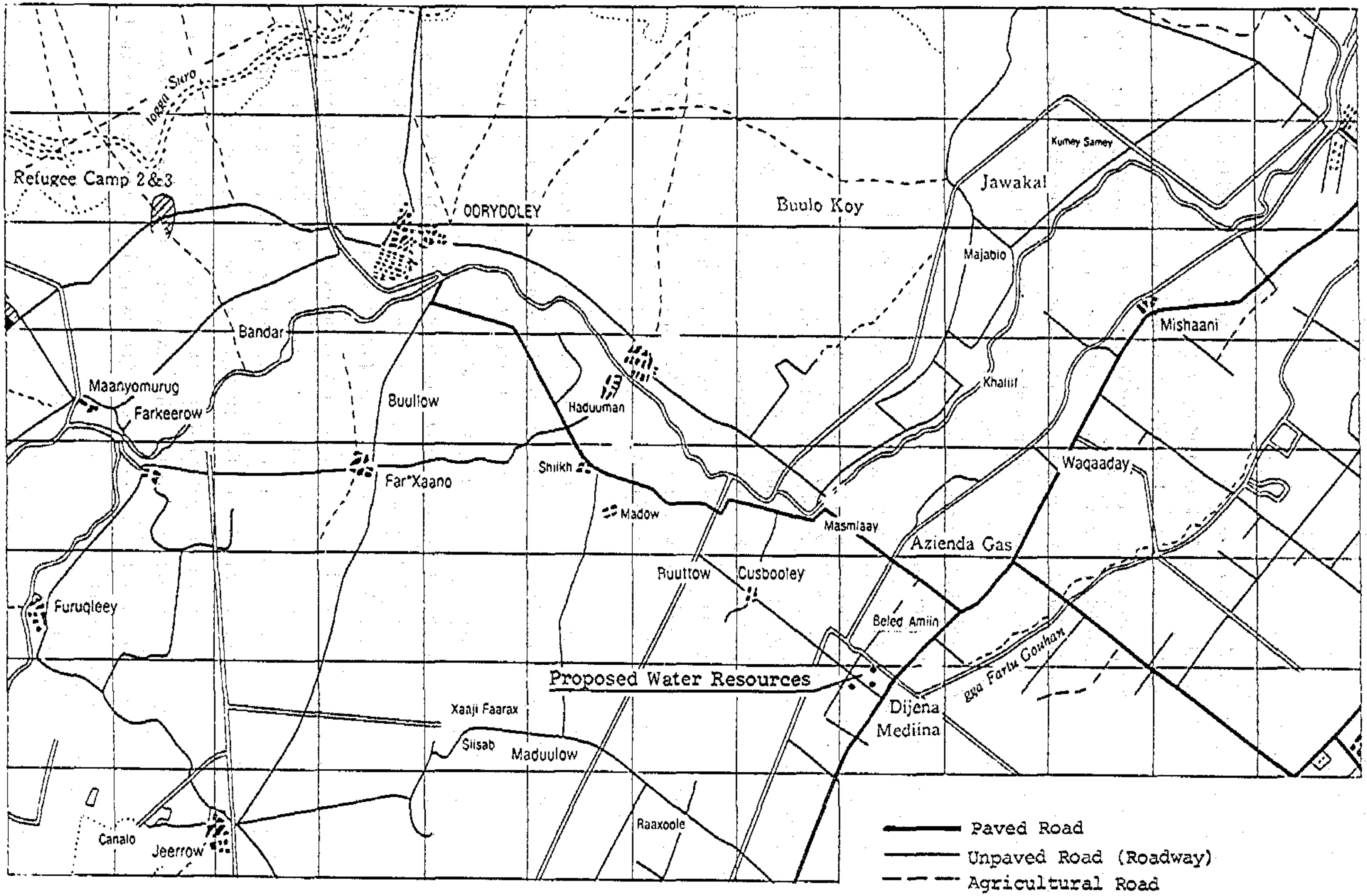
The network of roads around Qoryooley Town and the refugee camps including the water resource, Beled Amin, is shown in Fig. 3-18. A road includes 2 lanes with two 50-cm shoulders and without side walks. The roads are paved by the surface dressing method (Africa's most prevalent type, lower in quality than Japanese rural pavement). The condition of pavements is very poor with holes everywhere and some the road is raised here and there due to poor patchwork repairs. These conditions prevent cars from running at a certain continuous speed.

All roads, branching from the main road from Shalambood to Qoryooley and leading to the villages, are non-paved and get muddy during the rainy season preventing cars from passing.

As with roads, the bridges over the Shabelle River and the irrigation channels are damaged with no satisfactory maintenance and repairs being done. The approach section of the bridges and the culverts are so heavily damaged that the bridges' parapets must be repaired as urgently as possible.

Except for Qoryooley Town, there are no electric power stations nor electric supply facilities. In Qoryooley Town, electric failures often occur due to the lack of fuel. The water treatment plant is equipped with a diesel engine, a pump and a 15 KW motor.

Fig. 3-18 Road Next-work of Proposed Area



There are virtually no communication facilities connecting the Capital, Mogadishu, with Qoryooley Town. Partially because of the poor electric supply, there are no telephones connecting the villages with Qoryooley Town, and also between villages. All communication depends on automobiles. As broadcasting facilities, a national radio relay station is located on the outskirts of Qoryooley Town.

(3) Status of water supply

Only Qoryooley Town is provided with water supply facilities among the villages surrounding the refugee camps. The water supply conditions for daily use of the villages are shown in Table 3-9. Most of the villagers use the water of the Shabelle River or water channels during the rainy season and carry it to each house. At certain villages, they use the shallow well water with a high salinity for miscellaneous use.

The details of the water facilities in Qoryooley Town are explained in Table 3-10. The town people are supplied with water from the Shabelle River, after being treated by natural settling basin and slow sand filter. They are supplied from 6 public water filling stations, a donkey cart filling station, 20 house connection for public use and 60 house connections for domestic use. At each public water filling station a person in charge of water rates collection, appointed by WDA, is posted during the water supply hours to collect the charge of So.Sh 1 per 100 ℓ. The water charge for 60 house connections for domestic use is So.Sh 120 per month. It is the woman's job to go to the public water filling stations. They use jugs (20 - 30 liters) or buckets (10ℓ) for carrying water back to their houses.

Near the water purification stations a donkey cart filling station, which is exclusively for donkey carts with a 200-liter drum, is located and the water is mainly used for selling. The water is sold at So.Sh 20 for 200 liters.

When the Shabelle River or the water channels dry up during the dry season from December to March, town people and villagers dig in the river or water channel bed to obtain the subsoil water for their daily use. Wealthy people go to Shallambood to draw water or buy water from water sellers at So.Sh 40 for 200 liters, double the normal price.

In any case, a stable and safe water supply is guaranteed only in Qoryooley Town during the period when there is a water flow in the Shabelle River. Because of such water supply conditions, the generation rate of water-related diseases (Table 3-11) and mortality are comparatively quite high in this region where a large population is concentrated.

Table 3-9 Water for Daily Use in Villages around Camps

	Water for daily use ordinary	Water for daily use Dry season
Beled Amin	Shallow well(one)	-
Dijena	Irrigation ditch	Ditch excavation, Shallow well (one)
Mediina	Shallow well(three)	-
Azienda Goas	irrigation ditch(man-power transportation)	Ditch excavation
Urogle	"	"
Musharai	"	"
Bullbu Cusbooley	"	"
Dhanada	"	"
Bule Sheekh	Shabelle River(Donkey transportation)	Riverbed excavation of Shabelle River
Haduuman	1 Shallow well, Shabelle River for miscellaneous water	
Gaywarrow	Shabelle River	Reservoir (2 km away)
Jasiina	Shabelle River	Riverbed excavation of Shabelle River
Farxaau	Irrigation ditch, reservoir	Reservoir (2 km)
Dharqanley	Irrigation ditch	Ditch excavation
Bandar	Shabelle River	Riverbed excavation of Shabelle River
Maanyofarax	"	"
Farkeero	"	"
Gorgaal	"	"
Aranoy	"	"
Cabdi cali	"	"

Table 3-10 Existing Facilities of Qoryooley Town

	Capacity : 600 m³/day	10 hour operation
1	Raw water pumping plant 41.25 H.P. 3" x 160m	Diesel engine pump Copper pipe line (from Shabelle River to Raw Water storage reservoir - Basin)
2	Raw water storage reservoir Capacity : 36,000 m³ Raw Water Storage for Dry Season (for 2 months) Natural settling Basin	
3	Settled pumping station 41.25 H.S.	Diesel engine pump
4	Slow sand filter 126 m^2 x 2 basins	Filter speed for 2 pools operation; 5.7 m/day Filter speed for 1 pool operation; 11.4 m/day
5	Purification pump basin Foundation RC circular type, reinforced concrete tank	∅9.3m x H2.25 152 m³ (for 2.5 hour)
6	Elevated tank Capacity Head	25 m³ x one GL + 9 m
7	Water distribution pipes 3" x 1,820m	Steel pipes
8	Public hydrant 6 public water filling stations (with 5-hydrants) (2 public water-filling stations are located near overhead tank (25 m³ x H3 m)) 1 donkey cart filling station	
9	Each water supply amount of 6 public water stations and a donkey cart filling station No.1 10 - 15 m³/day No.2 35 - 50 m³/day No.3 25 - 35 m³/day No.4 10 - 12 m³/day No.5 30 - 50 m³/day No.6 25 m³/day Donkey cart filling station 40 - 60 m³/day	

Table 3-11 Occurrence of Disease Affected by Water

‰

Region	Male	Female	Total
Banadir	2.5	2.3	2.4
Bakool	0	0	0
Bari	0	0	0
Baidoa	58.0	67.0	63.0
Galgadua	4.0	20.0	12.0
Gedo	10.0	0	4.0
Hiran	131.0	128.0	129.0
Lower Juba	205.0	187.0	196.0
Lower Shabelle	174.0	188.0	182.0
Central Juba	97.0	81.0	91.0
Mudug	95.0	81.0	88.0
North West	26.0	22.0	24.0
Nugal	14.0	6.0	9.0
Sanag	0	11.0	6.0
Togdheer	27.0	70.0	51.0
W. Gal	1.1	2.1	1.7
Nomads	109.0	45.0	76.0
Total	65.0	62.0	63.0

3-4 Status of Existing Wells and Facilities

Groundwater development of the Beled Amin district started in the 1960's for irrigating banana farms. At least 67 groundwater wells were drilled in 1964. These wells were drilled by the Italian Farmer's Joint Capital. But, because of economic difficulties that took place later, this joint entity was dissolved in 1966, and the project was taken over by the officially recognized organization called the National Banana Board in 1970. Since then, all financing for groundwater well drilling has been arranged by this organization. By 1976, at least 65 wells had been drilled.

In 1982, a company called Somali Fruit was established and they have excavated at least 30 wells up to now. These wells were all drilled with the help from Italian capital, and only Italian drilling machines and equipments were used for the operation.

The majority of existing wells have 'sizes' ranging from 200 to 400 mm in finished diameter with 400 - 600 mm in drilling diameter, 60 - 95 mm in depth. It is reported that the construction of these wells was carried out with steel casing pipes and strainers, using the rotary method and percussion boring method.

In the case of the percussion method, excavation accidents like jamming are more likely to occur.

The surface-driving type turbine pump with a diesel engine (60-100 HP) and pumping capacity of 40 liters to 50 liters/sec (144 - 180 m^3/h) is used.

The pump house is simple enough to protect the diesel engine from rain and direct sunlight. The diesel engine is removed for 8 months from April to November when the water of the Shabelle River is used and returned for 4 months from December to April (dry season).

Fig. 3-19 Conception Figure of Existing Water Supply Facilities in Qoryooley Town

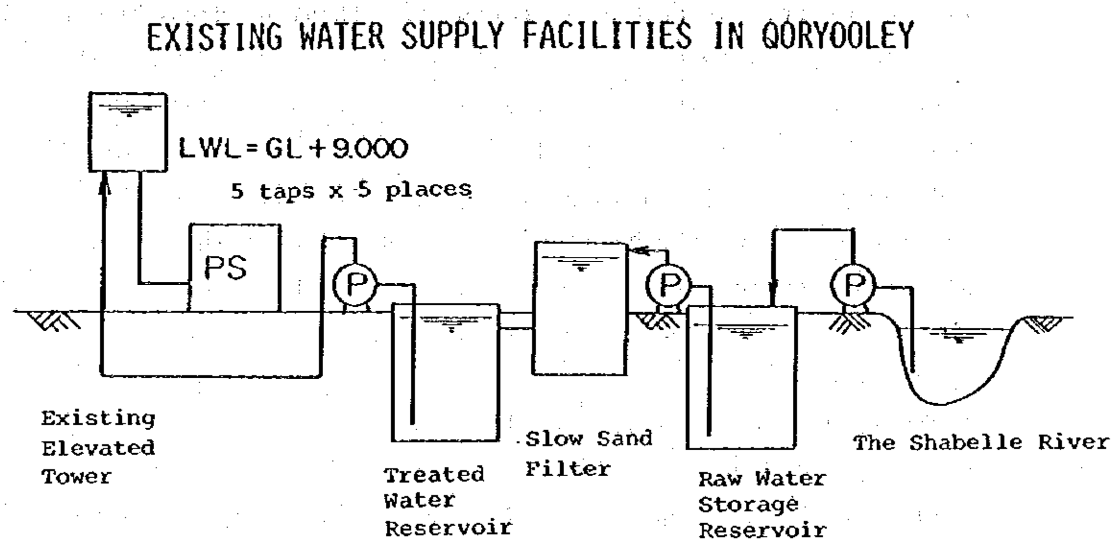
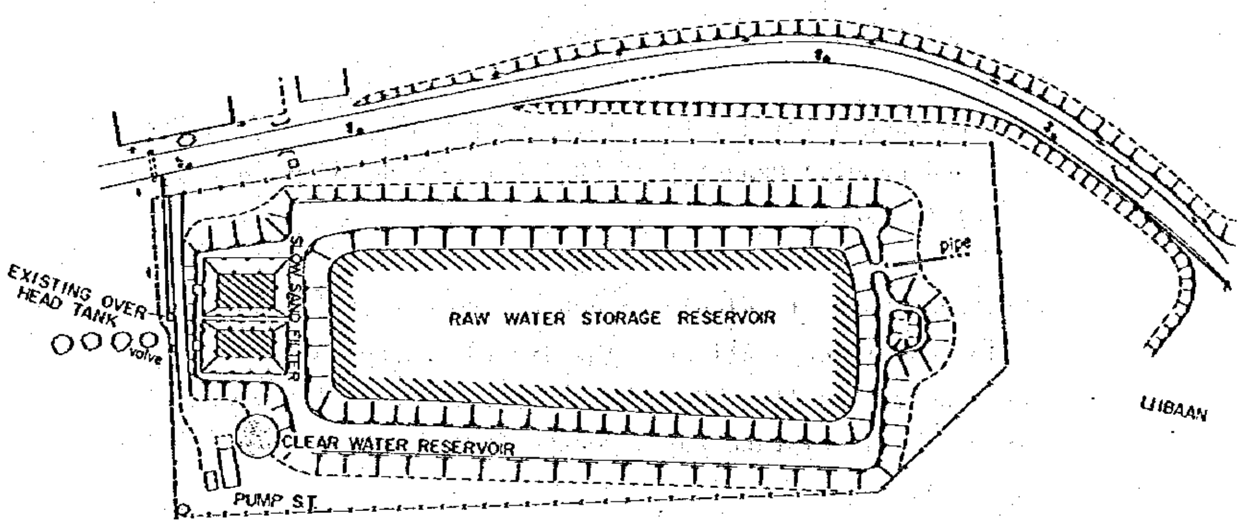


Fig. 3-20 Existing Water Supply Facilities in Qoryooley Town



CHAPTER 4

CONTENTS OF THE PROJECT

CHAPTER 4 CONTENTS OF THE PROJECT

4-1 Purpose of the Project

As mentioned in Section 2-5, the Project constitutes part of the Establishment Project for water supply, aimed to supply stable, safe and clean water to the 35 refugee camps accommodating 700,000 refugees, as well as to provide infrastructure for the surrounding area, while promoting the settlement of the refugees, the Project shares the establishment of water supply facilities for the 3 refugee camps in Lower Shabelle Region.

In relation to the Project, establishment of water supply facilities using groundwater as water resource has been completed, or is under way for regions other than Lower Shabelle Region, i.e. Northwest, Hiran and Gedo regions.

Execution of the Project set solely for Lower Shabelle Region, has been delayed, since good quality groundwater is not available in the neighborhood of camps and must be obtained from Beled Amin, 19 km away from the camps (see 4-2-3), for a stable and year-round supply.

The Project is concerned with refugees, but shall also contribute to the progress of the National Water Supply Decade through the arrangement of water supply in the area concerned.

Futhermore, by freeing the refugees and nomads from dependence upon the Shabelle River with a stable supply of clear and safe water, it becomes possible to have them engaged in development of agriculture and stock-farming in larger areas of the Lower Shabelle Region, which has a high potential, thereby making it possible to eventually exert a favourable influence upon the National 5-Year Development Plan, whose major aim is to develop agriculture and stock-farming.

4-2 Examination of Basic Items

Prior to preparation of a draft plan for satisfying the basic requirements, the following items were discussed with the Government of Somalia and examined through site surveys.

4-2-1 Target Year

The target year 1990 of the National Water Supply Decade of Somalia shall also be adopted here, though it is not specified in the written Requests.

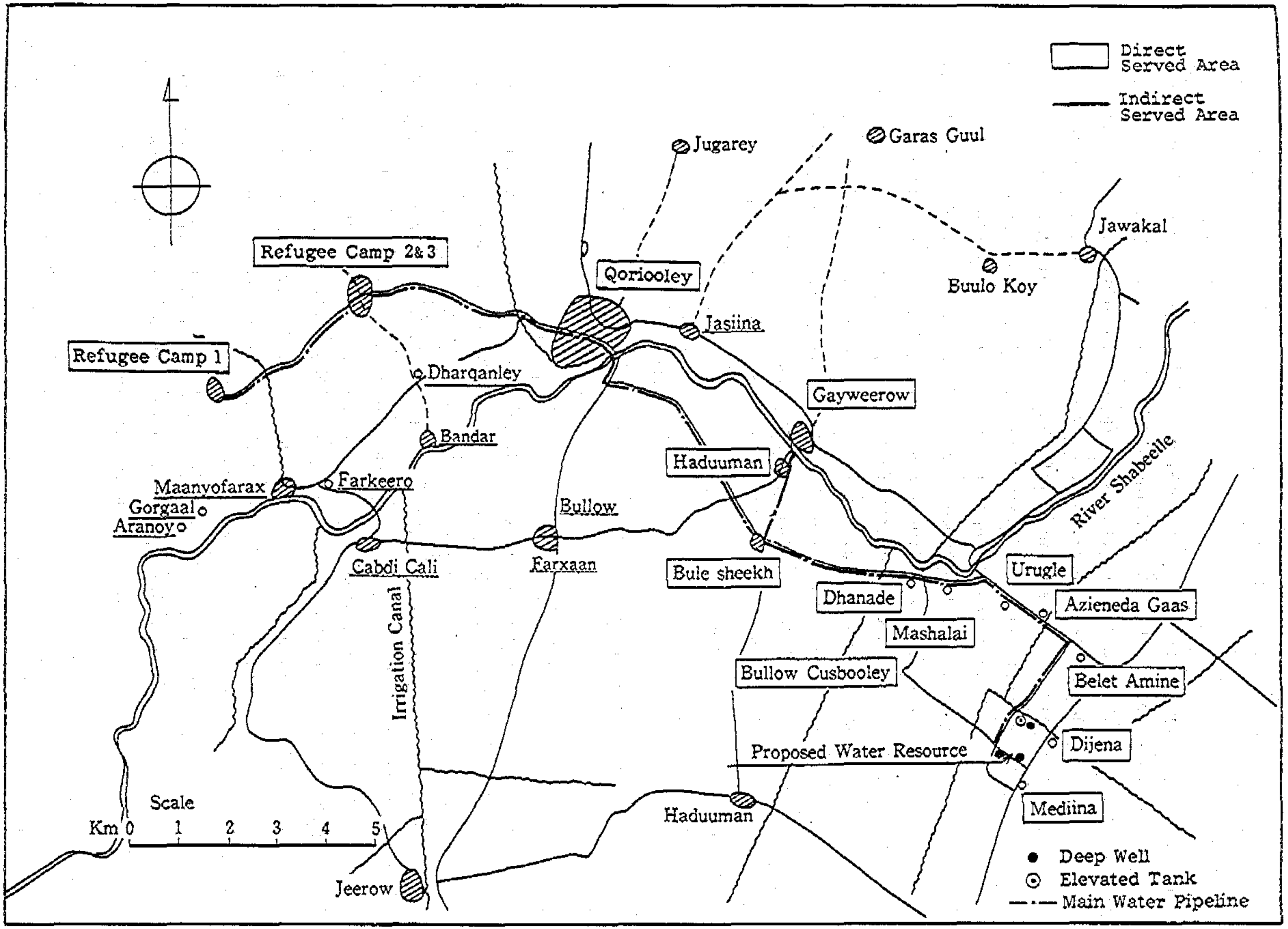
The funds for the National Water Supply Decade with its completion aimed at 1990, depend mostly upon foreign aids, and by 1984 the Decade has secured only 11% of the intended total funds. Thus, in this situation, it would not be reasonable that for the Project alone a long-term plan be set on a large scale, because it will lack proper balance with other projects, unfavorably affecting their progress. Thus the target year of this Project shall be set to 1990.

4-2-2 Served Area

Not only the three refugee camps but also Qoryooley Town and villages in the area surrounding these camps shall be served by the Project. This is intended to meet the Requests which have been prepared with a view of providing the refugee camps with a better environment to facilitate refugees settling down while securing the infrastructure for the neighboring areas for the better living of the people of the Lower Shabelle area, including refugees. As water is planned to be taken from the groundwater resource at Beled Amin, the villages situated along the transmission pipeline connecting this resource to the intended served area of the Project should preferably be served.

Accordingly, the served area includes the three refugees camps, Qoryooley Town and 20 villages (see Fig. 4-1). Of these, the camps, Qoryooley Town and 11 villages (whose name is surrounded

Fig. 4-1 Proposed Area and Main Pipe Line



by a square in Fig. 4-1), water is transmitted directly to the villages by transmission pipelines and are supplied with the aid of a public water filling station provided in each village (hereinafter referred to as direct served area). The remaining nine villages lying within 4 km of the nearest water transmission pipeline, underlined in Fig. 4-1, are supplied by a donkey cart filling station situated on the transmission pipeline (hereinafter referred to as indirect served area), to which people must go to secure water. This pipeline incorporates the service water quantity and pressure necessary for direct water service when an extension of the Project is made in future. The time for a villager to go to secure water from such a donkey cart filling station and come back to his village, which is covered by the Project, will presumably be no longer than 1 hr. and 40 min.

4-2-3 Water Intake

(1) Water Resource

As a water resource in and around the Project area both surface and groundwater is available. Surface water is not considered to be suitable as a source of water supply, because even the Shabelle River, which has a great catchment basin, ceases to flow in the dry season, i.e. December through March. The groundwater obtained from shallow wells is also unsuitable as drinking water because it contains a high salinity. Thus only groundwater obtained from deep wells can be used as the source of water supply.

Even deep groundwater may contain salinity, according to its location, so that care must be taken when locating the position of the water intake.

Existing data and the analytical results of this investigation are detailed in Sec. 3-2. The deep groundwater is distributed in a favorable aquifer which lies 10-80 m below the current land surface and consists of sand and grit. This deep groundwater is confined, and the water head is at its maximum in the neighborhood of Beled Amin and reduces toward Qoryooley and Shallambood. The salinity concentration is lowest in the neighborhood of Beled Amin and increases toward Qoryooley and Shallambood. According to Somalia criterion for drinking water, the salt concentration shall be less than 2,000 ppm, and the areas meeting this criterion are a region extending from Beled Amin to Sarde Saalax and 3 km southwest thereof and a region stretching from Golweyn to Mareer.

The specific rate of springing from the existing deep wells ranges from 1.0 to 65.6 $m^3/h/m$, and in a region extending from Beled Amin to Sarde Saalax and the area around Golweyn southwest Sarde Saalax a very high specific capacity (20 $m^3/h/m$) is obtained.

From these considerations about the water head, quality and specific capacity of the deep stratum of groundwater, no other candidate location for water source than the abovementioned region from Beled Amin to Sarde Saalax and the area around Golweyn will possibly be chosen, this may be said particularly from the point of view of water quality.

Among these candidate locations, the Beled Amin region, which lies nearest to Qoryooley and the refugee camps, will be the most favorable in terms of construction cost.

Accordingly, the final judgement is such that the Beled Amin region is the most favorable place for the location of a water resource, when taking into account its water head, quality and specific capacity, as well as the estimated costs of construction and associated works.

(2) Hydraulic Coefficient and Water Quality

a. Hydraulic coefficient

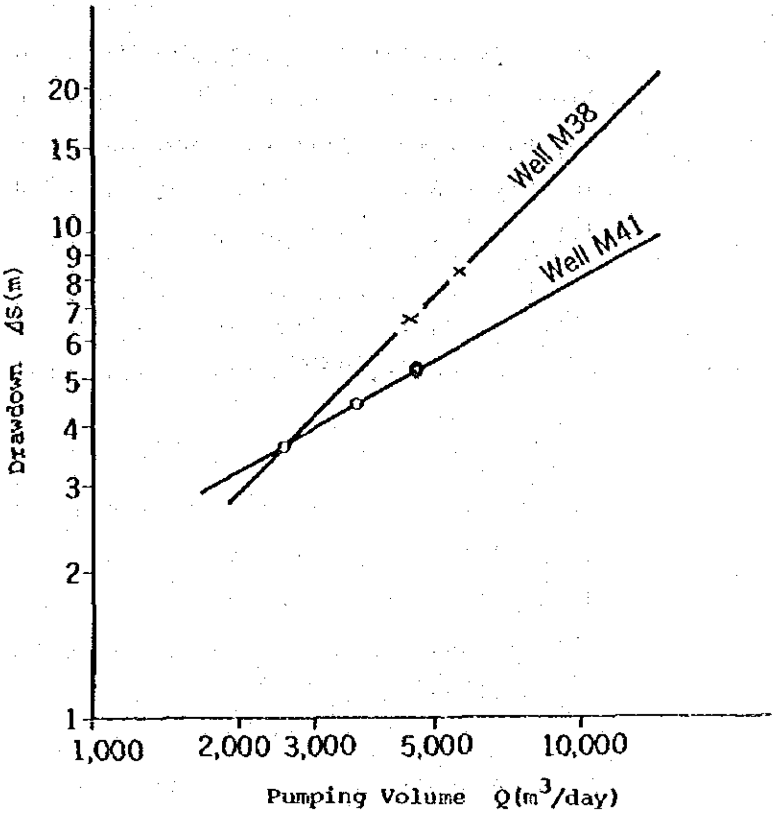
In the Beled Amin region, a good aquifer of groundwater consisting of grit is distributed 47-84 m below the current land surface, as shown in Fig. 3-4.

There are many wells already in service for pumping water from this stratum, and among them the wells M41 and M38 are subjected to a stepped pumping test and a quantitative pumping test. The results of the former are as shown in Table 4-1 and in Fig. 4-2.

Table 4-1 Results of Stepped Pumping Test

Well No.	Static water level (m)	Dynamic water level (m)	Drawdown (m)	Specific capacity (mr/hr/m)	Average specific capacity
M41	5.520	9.17-10.45	3.64 -4.93	28.2-36.5	32.2
M38	4.845	9.3 -13.14	4.455-8.295	27.9-35.9	30.9

Fig. 4-2 Relation between Drawdown and Pumping Volume



The results do not show any clear limit to the pumped volume, but it is judged that the specific capacity of the grit stratum can be at least 30 m^3/hr/m on the average. The hydraulic coefficient of the grit stratum derived from the quantitative pumping test are given on Table 4-2.

Table 4-2 Results of Quantitative Test

Well No.	Transmissivity T (m2/sec)		Storativity S		Any observational well?	Pumped Quantity (m3/sec)
	Theis's formula	Jacob's formula	Theis's formula	Jacob's formula		
M41	4.57×10^{-3}	-	4.78×10^{-4}	-	M38	0.0341
	1.07×10^{-2}	6.94×10^{-3} 7.81×10^{-3}	5.35×10^{-4}	-	No	0.0341
M38	6.57×10^{-4}	1.20×10^{-2} 2.30×10^{-2}	1.62×10^{-6}	-	Yes	0.066

The test results for the well M41 used as an observational well are considered to represent the mean values for this grit stratum, and T and S are presumably 4.6×10^{-3} m^2/sec (397.44 m^2/day) and around 4.8×10^{-4}, respectively.

This value, T, is greater than the mean value for the existing wells, 222 m^2/day, demonstrating that it is a good aquifer.

The water is judged to be confined from the data that the value S is in the order of 10^{-4} and that water level recovery is made within approx. two hours (see the s-t curve plotted from the pumping test shown in Annex-11).

b. Pumping quantity and its influence

It was judged from the results of the pumping test, as mentioned above, that a deep well in the Beled Amin region provides at least a specific rate of springing of 30 $m^3/hr/m$. The limit of pumping volume could not be checked, but the drawdown of a pumped well shall preferably be controlled so as to prevent adverse influence upon the existing wells as well as aging of the well pumped, and therefore the drawdown of a planned well should be set to approx. 5 meters.

The extent of influence is now examined on the basis of these pumping conditions.

* Constants of aquifer

$T = 4.6 \times 10^{-3}$ m^2/sec

S = 4.8 x 10-4

* Pumping conditions

$Q = 1500\ m^3/day$

$T = 4.6 \times 10^{-3} \times 24 \times 3600 = 397.44\ m^2/day$

$S = 4.8 \times 10^{-4}$

With these values given, the following equations are established through the use of Theis's formula:

$$s = \frac{Q}{4\pi T} w(u) = 0.300\ w(u)\ \ldots\ldots\ (1)$$

$$u = \frac{S\gamma^2}{4Tt} \doteqdot 3.02 \times 10^{-7}\ \frac{\gamma^2}{t}\ \ldots\ldots\ (2)$$

where Q: Pumping quantity in m^3/day
T: Transmissivity in m^2/day
S: Storage coefficient
w(u),v: Well function
s: Drawdown in meters
γ: Well spacing in meters
t: Pumping operation time in days

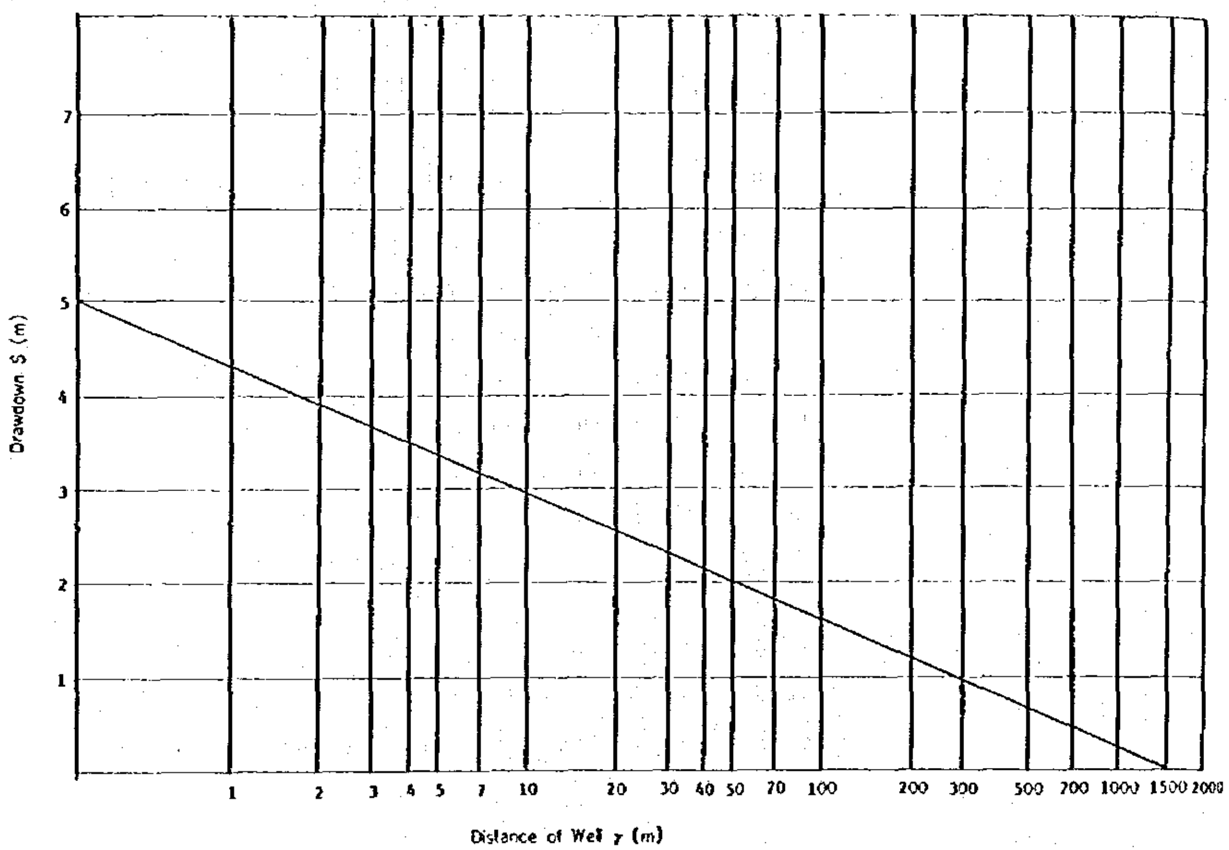
The relationship between the well spacing (γ) and drawdown (s) determined, by using Equasions. (1), (2) with the pumping operation time (t) set to 1 day, is shown on Table 4-3 and Fig. 4-3.

Table 4-3 Well Spacing and Drawdown

Well spacing γ(m)	u	w(u)	s(m)
0.15	6.80×10^{-9}	18.0	5.4
1	$3.02 \times 1\text{-}^{-7}$	14.0	4.2
10	3.02×10^{-5}	10.0	3.0
50	7.55×10^{-4}	6.80	2.04

Thus the influence of the pumping quantity, when it is set to 1500 m^3/day (24-hr operation), turns out to be 1500 m as per Fig. 4-3.

Fig. 4-3 Well Distance and Drawdown



To prevent wells from interference with one another, the well spacing must be no less than 3000 m. Relations of the drawdown to its influencing extent are shown in Fig. 4-3, from which the drawdown for a well spacing of 450 m can be known as approximately 1.2 m. A pumping operation time of 10 hr/day allows approximate recovery of the water level from a drawdown of approximately 1.2 m on the previous day, so that the well spacing may be determined even to 450 m without bringing about any substantial problem. (For recovery of water level, see Annex 11).

Consequently it should preferably be proposed, taking account of possible influences upon the existing wells and prevention of aging of planned wells, that:

* Well bore: ∅ 300 mm
  Pumping quantity per well: 1500 m^3/day
  Drawdown: 5.0 m
  Moving level: 15.0 m
  Daily pumping operation time: 10 hr
  Well spacing: No less than 450 m

c. Water quality

The results of water quality analysis of the groundwater obtained from the well M41, which was subjected to the pumping test, are presented on Table 4-4.

Table 4-4 Result of Water Analysis
(Water Works Bureau, Yokosuka City)

Constituents	M-41	WHO-Highly Desireble	WHO-Max Permissible	Japanese criterion for water quality
Turbidity mmg/ℓ	0.2	5	25	2
Color "	1	5	50	5
pH	7.2	7.0~8.5	6.5~9.2	5.8~8.6
EC μΩ/cm	1,680	-	-	-
$CaCO_3$ mg/ℓ	*904	100	500	500
Total Alkalinity "	256	80	400	-
Chlorine "	102	200	600	200
Fluorine "	0.21	0.7	0.8	0.8
Fe "	0.04	0.1	1.0	0.3
Manganese "	*0.58	0.05	0.5	0.3
Mercury "	0	-	-	0
Copper "	0	-	-	1.0
Zinc "	0.04	-	-	1.0
Lead "	0	-	-	0.1
Sodium "	66	-	-	-
Potassium "	7	-	-	-
SO_4 "	790	-	-	-
Hydrogen "	0	-	-	0.05
Cadmium "	0	-	-	-
Total Solids	*1,480	500	1,000	500

The analytical results have disclosed that the WHO-Max is exceeded in three items, i.e. Ca hardness, Mn inclusion and total solids. The Ca hardness and total solids, which are related to the salt concentration, lie below the standard values estimated from the geological situation of Somalia. The Somalia criterion for salt concentration is 2000 in E.C. conversion. The high value of Mn total solids may be referred to the water which was pumped up from a well out of operation for a long time, and will decrease in the course of pumping operations.

4-2-4 Served Population

(1) Nominal population of refugees camps

The latest published population is 41,000 according to the investigation in 1981, but there is no data which indicates the current figures. A preliminary investigation has reported, by contrast, that the population may be approximately 20,000. The Project has decided to use the published population of 41,000 upon investigating the data from a site survey of the number of dwellings and family composition of refugee camp 1, and the registration cards for allocation of aid goods by UNHCR (see Annex-10).

(2) Nominal population of Qoryooley town and villages surrounding the camps

There are no well-supported recordings and the Project has estimated the population from the data based on Primary Healthy Care (PHC) investigation carried out by volunteers (see Table 4-5), and information collected from cadastres and tax books (not much reliable), or elders. The figures are shown on Table 4-5, in which the nominal population of the applicable areas as of 1984 reads 110,530.

Table 4-5 Investigation of Population

		(A)		(B)		Standard Population (1984)	Served Population (1990)
		Number of houses	Population	Number of houses	Population		
Direct Water Supply Area	Beled Amin	28	280			280	340
	Dijena	45	500			500	610
	Mediina	70	225			230	280
	Azienda Goas	150	380			380	460
	Urugle	38	115			120	150
	Musharai	18	30			30	40
	Bullow Cusbooley	300	2,000			2,000	2,440
	Dhanada	45	270			270	330
	Bule Sheekh	375	2,300			2,300	2,810
	Haduuman	400	3,023	1,400	6,980	3,020	3,690
	Gaywarrow	855	9,000	157	7,740	9,000	11,000
	Qoryoley			3,500	25,630	25,630	31,320
					Sub Total	43,760	53,470
	Camp 1					8,000	8,350
	Camp 2					18,000	18,790
	Camp 3					15,000	15,660
					Sub Total	41,000	42,800
					Total	84,760	96,270
Indirect Water Supply Area	Jasiina	223	1,161			1,160	1,420
	Farxaan	1,523	11,200	1,200	10,823	11,200	13,690
	Dharqanley	30	250			250	310
	Bandar	150	2,007	171	3,854	2,010	2,460
	Maanyofarax	400	2,480	530	4,530	2,480	3,030
	Farkeero	74	150			150	180
	Goygaal	600	3,200	260	5,240	3,200	3,910
	Aranoy	350	1,000			1,000	1,220
	Cabdi Cali	496	4,321	530	6,730	4,320	5,280
					Total	25,770	31,500
					Grand Total	110,530	127,770

(A) Field Survey this year (1985)

(B) Medical Office Survey (1984)

(3) Growth rate

According to the data in the National Water Supply Decade (see Table 4-6), the growth rates for the urban and rural area and nomads are 3.6, 3.4 and 2.9%, respectively, with the nationwide average at 3.2%. In the Water Service Facility Construction Plan for Qoryooley Town by UNICEF, 1981, the corresponding figure reads 3.0%. The Project has decided to use the figure of 3.4% as the growth rate for Qoryooley Town and the villages surrounding the camps.

Table 4-6 Fertility and Mortality Rates in Somalia

	Urban	Rural	Nomads	Somalia Total
Crude Birth Rate per 1,000	44.0	42.6	40.1	41.8
Crude Death Rate per 1,000	7.7	9.9	10.7	9.4
Percentage Rate of National Increase	3.6	3.4	2.9	3.2

Refugee camps have peculiar circumstances, and their natural increase of population is assumed to be 300 heads annually, as derived from their actual figures of 350 births and 50 deaths per year on the average for the past years.

(4) Served population

The planned served population of the three refugees camps, will be 42,800 as calculated from the nominal population of 41,000 in 1984 at the natural annual increase of 300 heads.

The served population of the villages outside the camps will be 84,970 as calculated from their nominal population of 69,530 with a growth rate of population increase of 3.4%.

The served population of individual villages are shown on Table 4-6 and its distribution is shown in Fig. 4-4; the direct water supply population is 96,270 (incl. camps), while the indirect water supply population is 31,500. The whole served population is 127,770.

4-2-5 Daily Maximum Water Consumption per Head

The unit water consumption is 15.2 lcd according to a survey at public water filling stations in the refugee camps and Qoryooley Town (see Annex 13).

The establishment Project for water supply facilities for refugee camps by UNICEF gives the corresponding figure of 15 lcd.

The National Water Supply Decade specifies that 10 lcd in 1981 shall be increased to 25 lcd in 1990. The figures however include water for livestock.

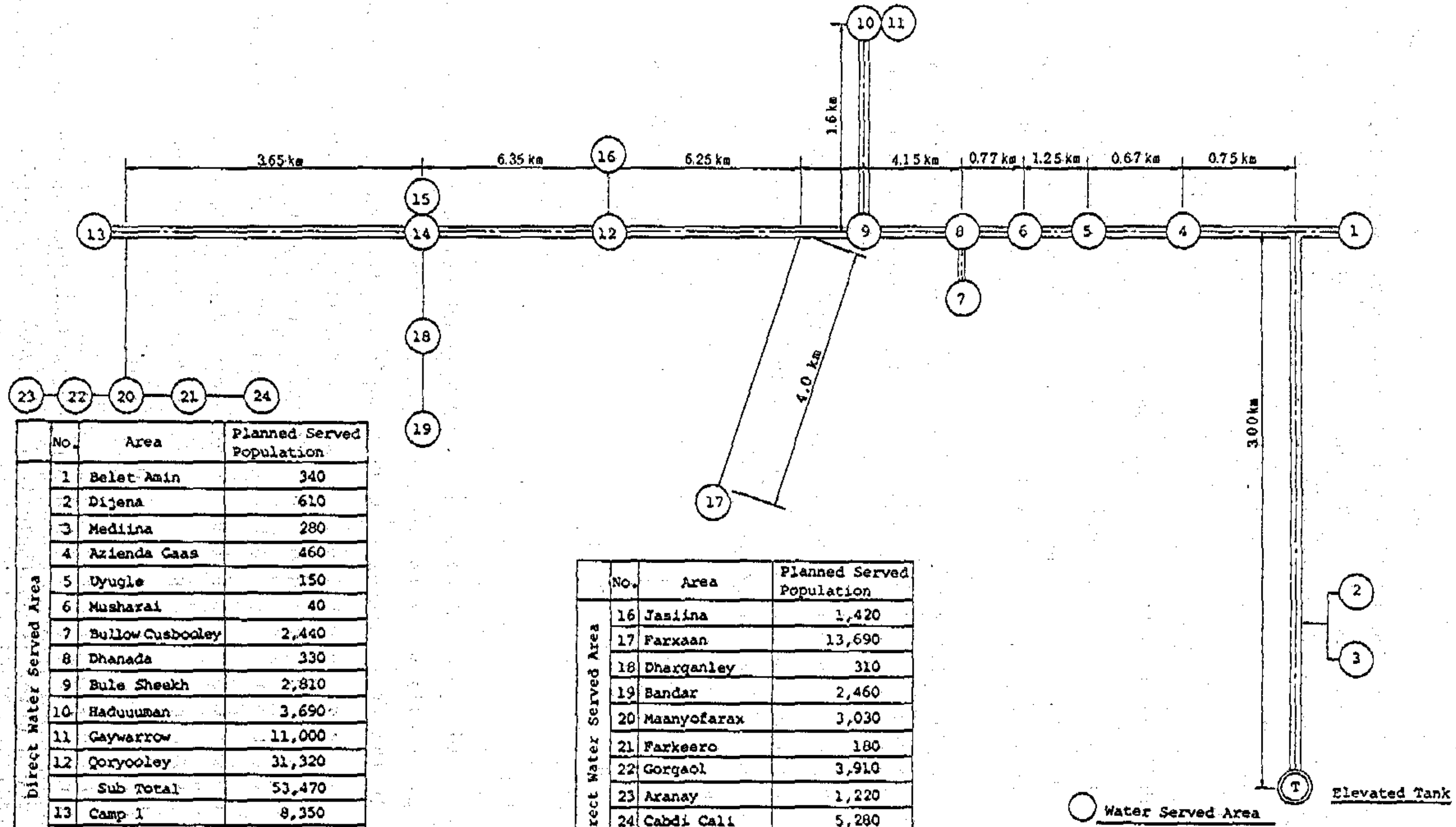
The Project has thus decided to use 15 lcd as the unit water comsumption.

4-2-6 Water comsumption for Public Use

According to the planning for the construction of a water supply facility for the Qoryooley Town in 1981, which solely owns, in the Project area, a water supply facility capable of serving the water comsumption for public use, the public water consumption is set to 15% of the domestic water consumption. At present the town has 20 house connections for public use and daily consumption for public use is presumed to be 8 m^3/day, which corresponds to approx. 4% of the domestic water consumption of Qoryooley Town (approx. 200 m^3/day).

Currently there are 60 house connections for domestic use and consumption is approximately 24 m^3/day corresponding to approximately 12% of the total domestic water consumption.

Fig. 4-4 Distribution of Population



	No.	Area	Planned Served Population
Direct Water Served Area	1	Belet Amin	340
	2	Dijena	610
	3	Mediina	280
	4	Azienda Gaas	460
	5	Dyugle	150
	6	Musharai	40
	7	Bullow Cusbooley	2,440
	8	Dhanada	330
	9	Bule Sheekh	2,810
	10	Haduuuman	3,690
	11	Gaywarrow	11,000
	12	Qoryooley	31,320
		Sub Total	53,470
	13	Camp 1	8,350
	14	Camp 2	18,790
	15	Camp 3	15,660
		Sub Total	42,800
		Total	96,270

	No.	Area	Planned Served Population
Indirect Water Served Area	16	Jasiina	1,420
	17	Farxaan	13,690
	18	Dharganley	310
	19	Bandar	2,460
	20	Maanyofarax	3,030
	21	Farkeero	180
	22	Gorgaol	3,910
	23	Aranay	1,220
	24	Cabdi Cali	5,280
		Sub Total	31,500
		Total	127,770

According to the National Water Supply Decade, the share of house connections in the rural parts shall be increased to a level corresponding to 30% of the domestic water consumption, which means 2.5 times as much as the current figure for Qoryooley Town. If water consumption for public use is assumed to increase also to 2.5 times, similar to house connection, the public water consumption of Qoryooley Town should become 10% (4% x 2.5) of the domestic service water consumption. The public water consumption of the camps and the villages outside Qoryooley Town is estimated to increase to a level not higher than the current figure for Qoryooley.

Accordingly the estimated public water consumption is determined to be 5.5% through the following calculation:

$$10\% \times \frac{31,320}{127,770} + 4\% \times \frac{96,450}{127,770} = 2.45 + 3.02 = 5.47 \rightarrow \doteqdot 5.5\%$$

4-2-7 Water Leakage

The Water Supply Facility Construction Plan of the Qoryooley Town in 1981 sets the leakage to 10%.

In Japan, there is a criterion for prevention of water leakage, in which the percentage of effective utilization is specified to 86% (a water loss of 14%), but this value was set under the condition that the facility is not newly built and that the applicable area is furnished with a water service arrangement for house connections. The Project however includes mostly newly built facilities consisting chiefly of a main pipeline with little house connections, and therefore it will be reasonable to set the water loss to 10% approximately.

4-2-8 Water Supply Amount and Its Distribution

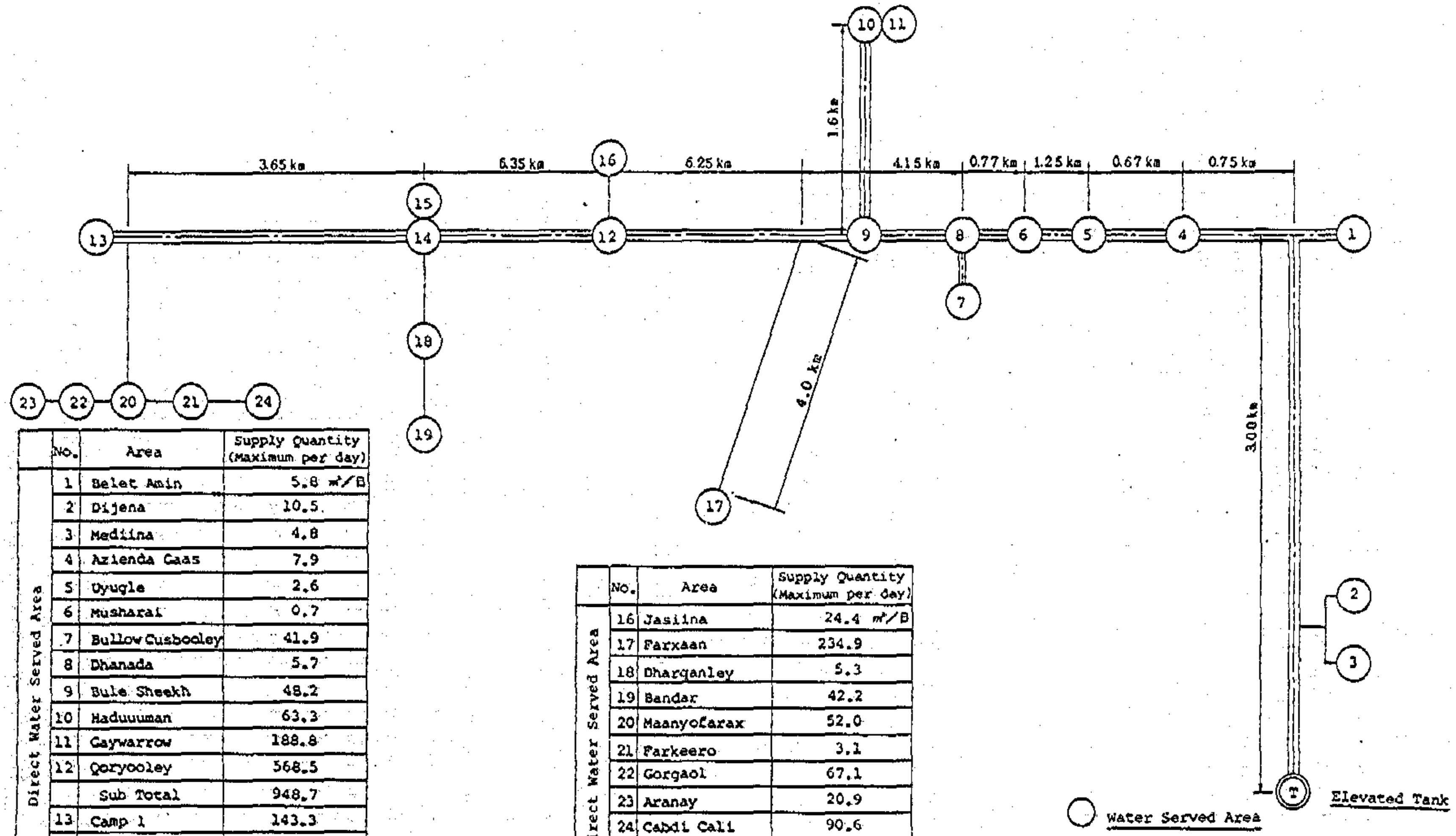
Domestic water consumption:

127,770 x 0.015 m^3/day/head = 1,916 m^3/day

Public water consumption (assumed to be 5.5% of the above):

1,916 m^3/day x 0.055 = 105 m^3/day

Fig. 4-5 Supply Quantity and Its Distribution



	No.	Area	Supply Quantity (Maximum per day)
Direct Water Served Area	1	Belet Amin	5.8 m³/B
	2	Dijena	10.5
	3	Mediina	4.8
	4	Azienda Gaas	7.9
	5	Uyugle	2.6
	6	Musharai	0.7
	7	Bullow Cusbooley	41.9
	8	Dhanada	5.7
	9	Bule Sheekh	48.2
	10	Haduuuman	63.3
	11	Gaywarrow	188.8
	12	Qoryooley	568.5
		Sub Total	948.7
	13	Camp 1	143.3
	14	Camp 2	322.4
	15	Camp 3	268.7
		Sub Total	734.4
		Total	1,683.1

	No.	Area	Supply Quantity (Maximum per day)
Indirect Water Served Area	16	Jasiina	24.4 m³/B
	17	Farxaan	234.9
	18	Dharganley	5.3
	19	Bandar	42.2
	20	Maanyofarax	52.0
	21	Farkeero	3.1
	22	Gorgaol	67.1
	23	Aranay	20.9
	24	Cabdi Cali	90.6
		Sub Total	540.5
		Total	2,223.6

Daily maximum consumption: 2,021 m^3/day

Water Leakage (assumed to be 10% of the above):
202 m^3/day

Daily maximum water supply amount:
2,223 m^3/day

The daily maximum water supply amount for each camp and village is shown in the Distribution map of water supply amount Fig. 4-5).

4-2-9 Fluctuations of Water Demand

Fluctuation of water demand must be made clear in order to make the optimum design for the ability of and operating method for each well pump, capacity of elevated tank, transmission and distribution pipeline diameters, and capacity of each public water filling station, etc.

Fluctuation of water demand were surveyed by measuring the water consumption of refugee camp 1, Qoryooley Town, (No.3 and 4 public water filling station and donkey cart filling stations as in Fig. 4-6) at 15 minute intervals in two different cases, i.e. under rainy and fine weather.

The results of the investigation for refugee camp 1 are shown in Fig. 4-7 (to be named Pattern 1), while the results for comparatively central zone No.3 and peripheral zone No.4 of Qoryooley Town are exhibited in Fig. 4-8 (Pattern 2) and 4-9 (Pattern 3), respectively. Fig. 4-10 shows the result for donkey cart filling station (Pattern 4). The time coefficients for them are given on Table 4-7.

The percentage of water served population for these four patterns 1, 2, 3 and 4 are 33.0, 34.2, 8.5 and 24.3%, respectively. Accordingly the time coefficients for the whole area covered by the Project are as shown on Table 4-7. The maximum time coefficient at this time is 1.394.

Fig. 4-6 Public Water Filling Station in Qoryooley Town

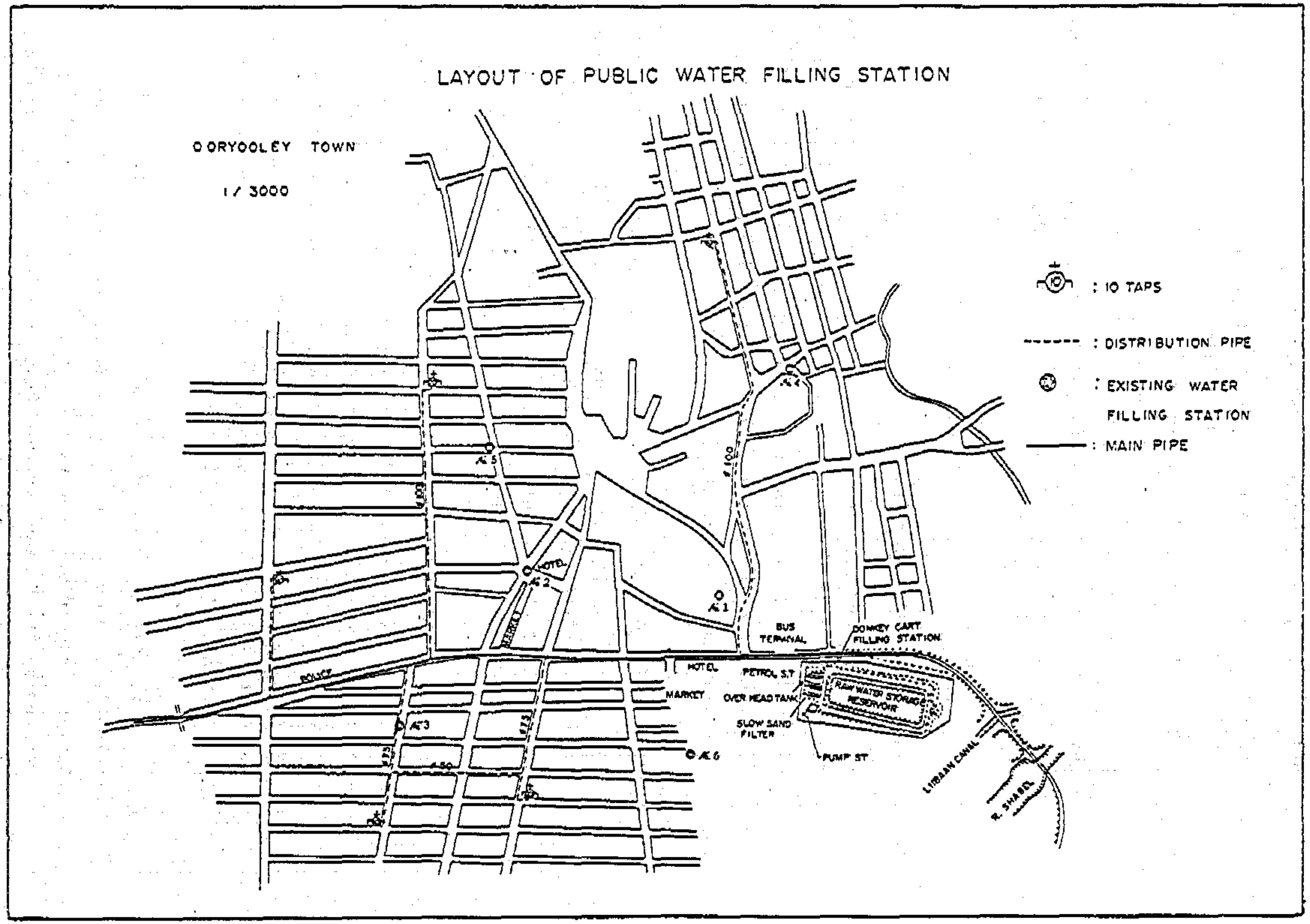


Fig. 4-7 Pattern (1) (Camp 1)

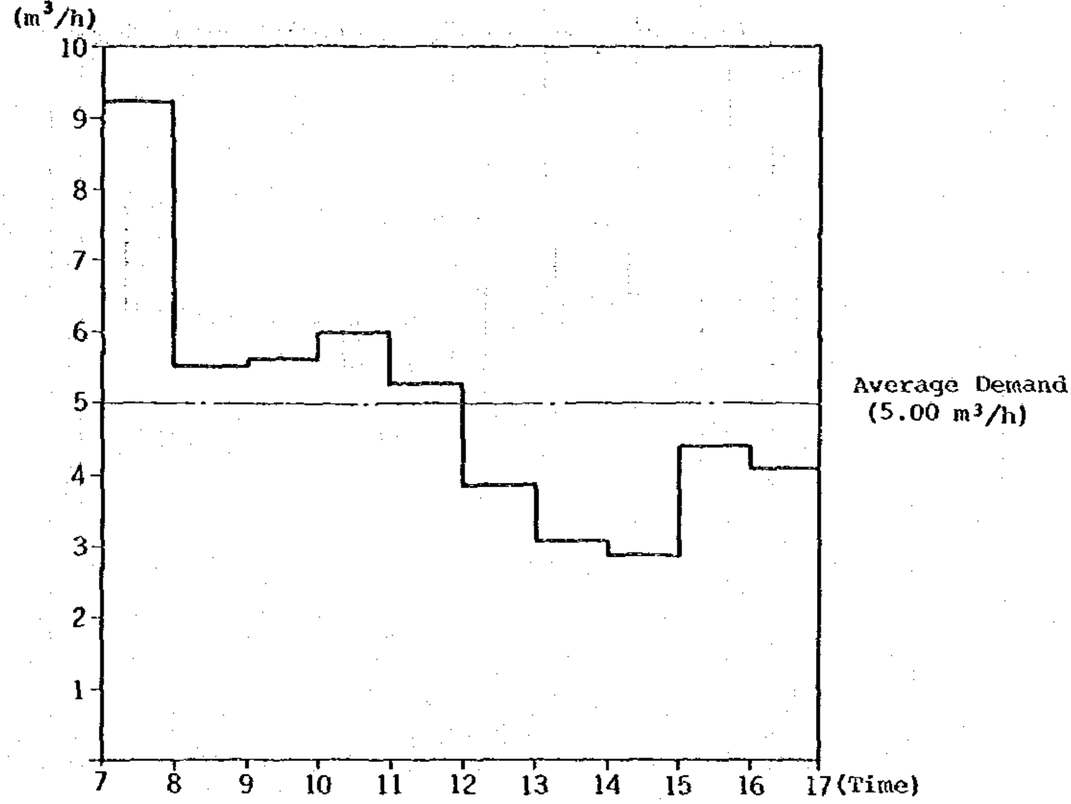


Fig. 4-8 Pattern (2) (Qoryooley Town No.3
Public Water Filling Station)

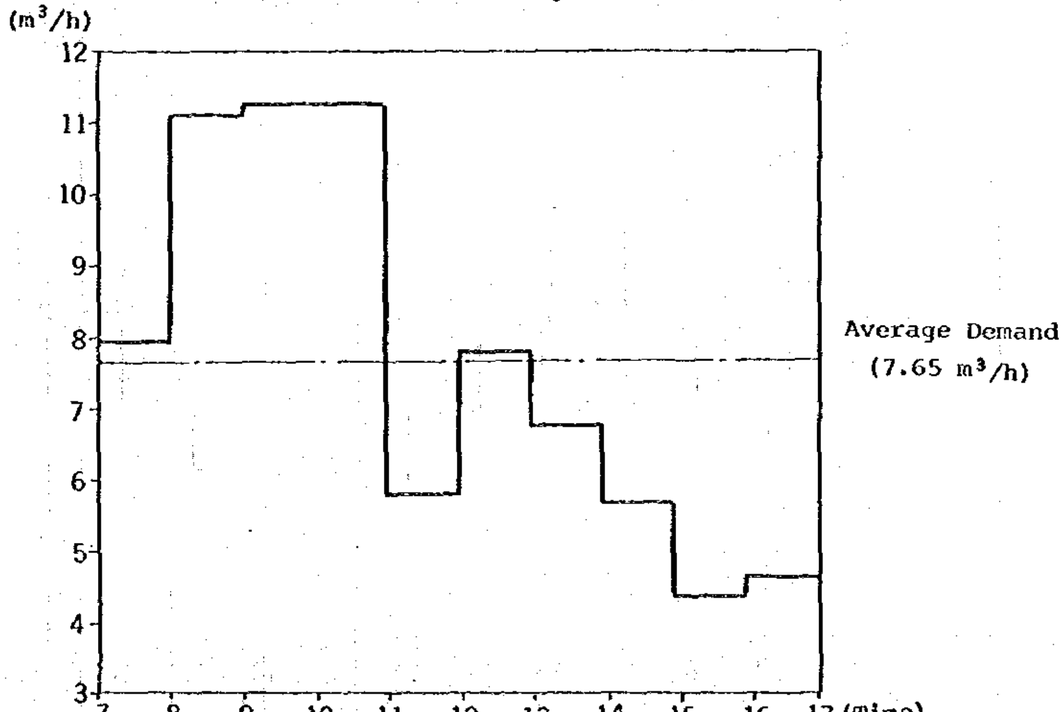


Fig. 4-9 Pattern (3) (Qoryooley Town No.4)

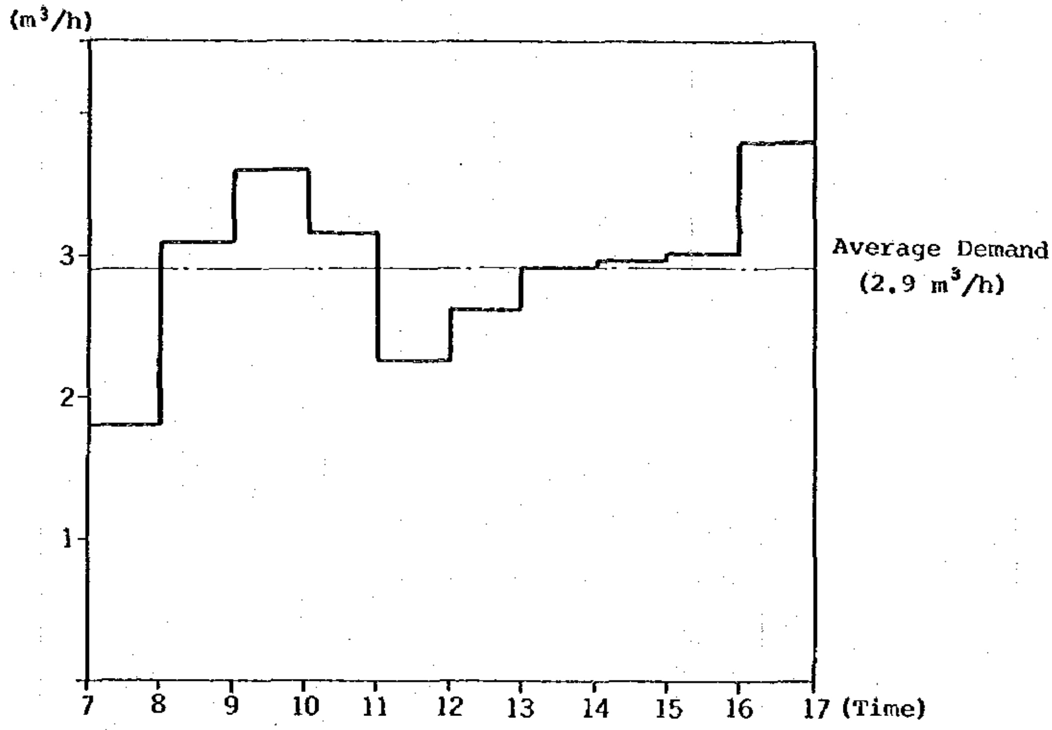


Fig. 4-10 Pattern (4)
(Qoryooley Town Donkey Cart Filling Station)

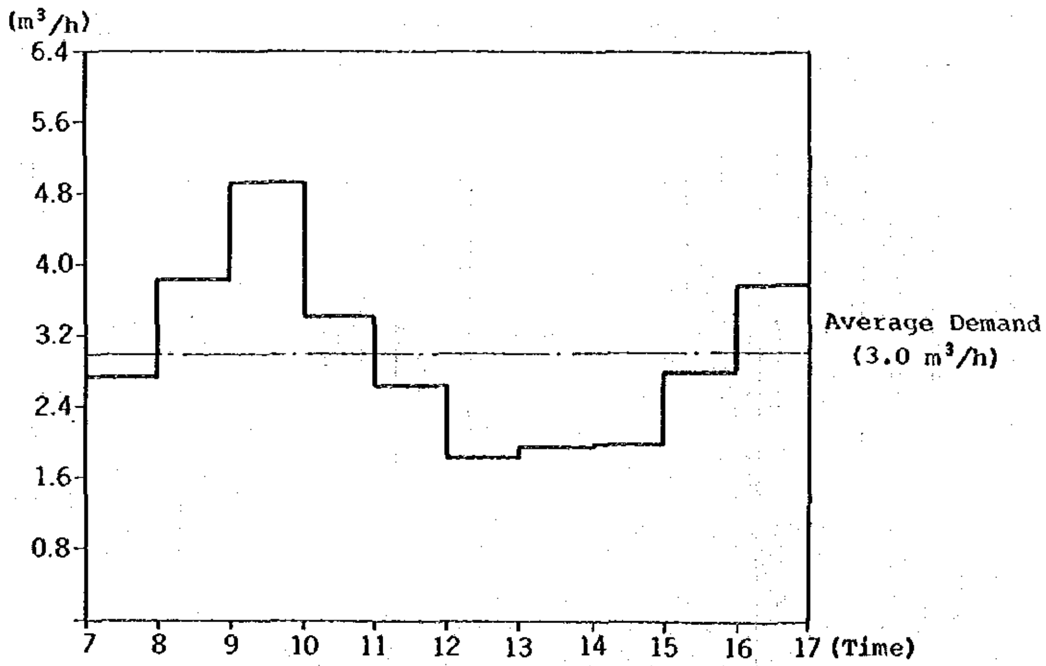


Table 4-7 Time Coefficient

Time	Pattern (1)		Pattern (2)		Pattern (3)		Pattern (4)		Time Coefficient for Total Water Served Area	Remarks	
	Time coefficient	0.330	Time coefficient	0.342	Time coefficient	0.085	Time coefficient	0.243		Peak-cut capacity	Time Coefficient after peak-cut
7	1.85	0.611	0.92	0.315	0.62	0.053	1.04	0.253	1.232		
8	1.11	0.366	1.28	0.438	1.07	0.091	1.45	0.352	1.247	9%	$\frac{5.112-0.9}{4} = 1.053$
9	1.12	0.370	1.64	0.561	1.25	0.106	1.47	0.357	1.394	6%	$\frac{5.112-0.6}{4} = 1.128$
10	1.20	0.396	1.15	0.393	1.09	0.093	1.47	0.357	1.239	3% 0%	$\frac{5.112-0.3}{4} = 1.203$ Max = 1.394
11	1.06	0.350	0.88	0.301	0.78	0.066	0.76	0.185	0.902		
12	0.77	0.254	0.62	0.212	0.90	0.077	1.02	0.248	0.791		
13	0.61	0.201	0.65	0.222	1.00	0.085	0.88	0.214	0.722		
14	0.58	0.191	0.66	0.226	1.02	0.087	0.74	0.180	0.684		
15	0.88	0.290	0.94	0.321	1.05	0.089	0.57	0.139	0.839		
16	0.82	0.271	1.26	0.431	1.31	0.111	0.60	0.146	0.959		

Fig. 4-11 Water Pressure of Public Water Filling Station

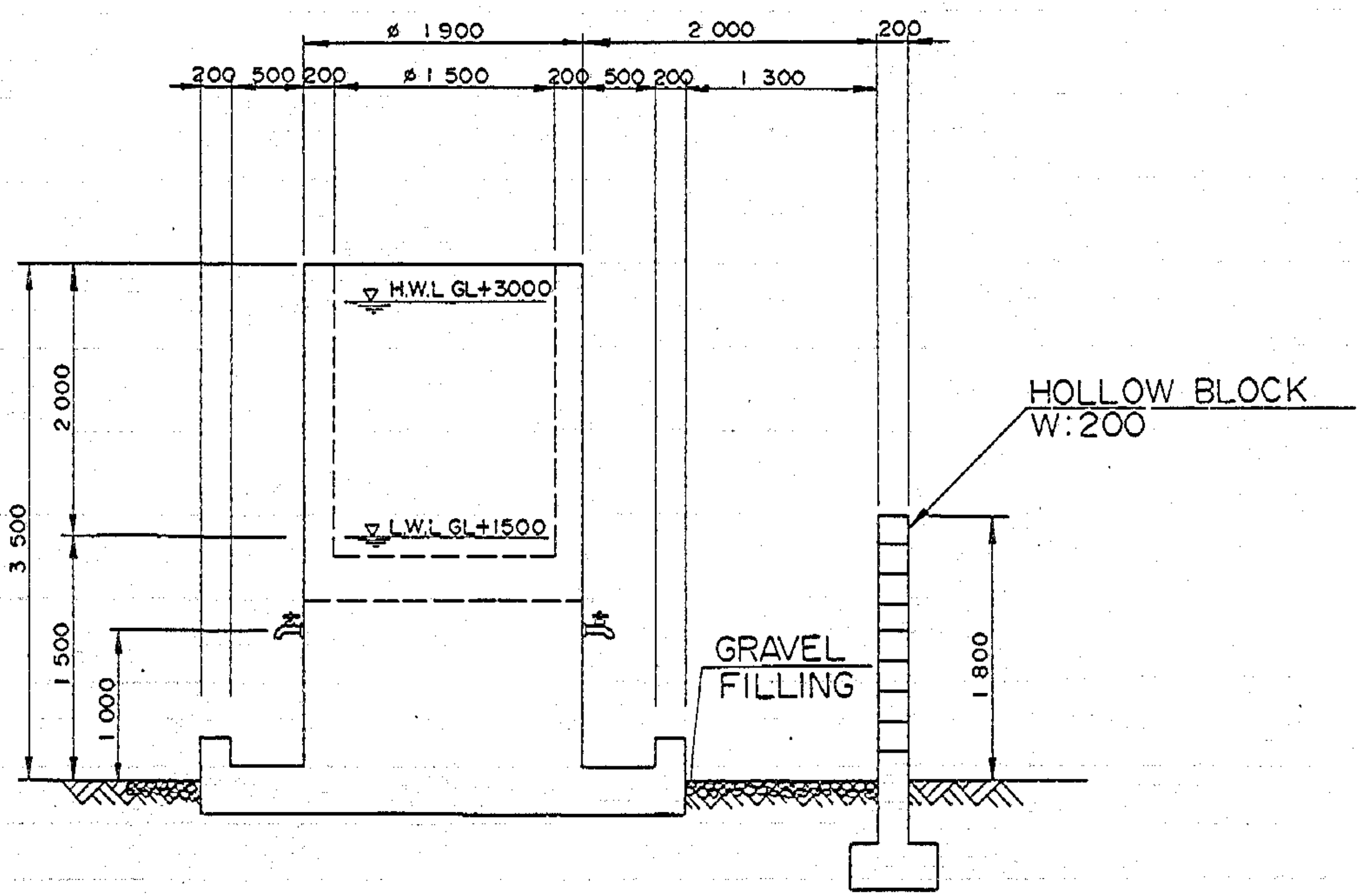
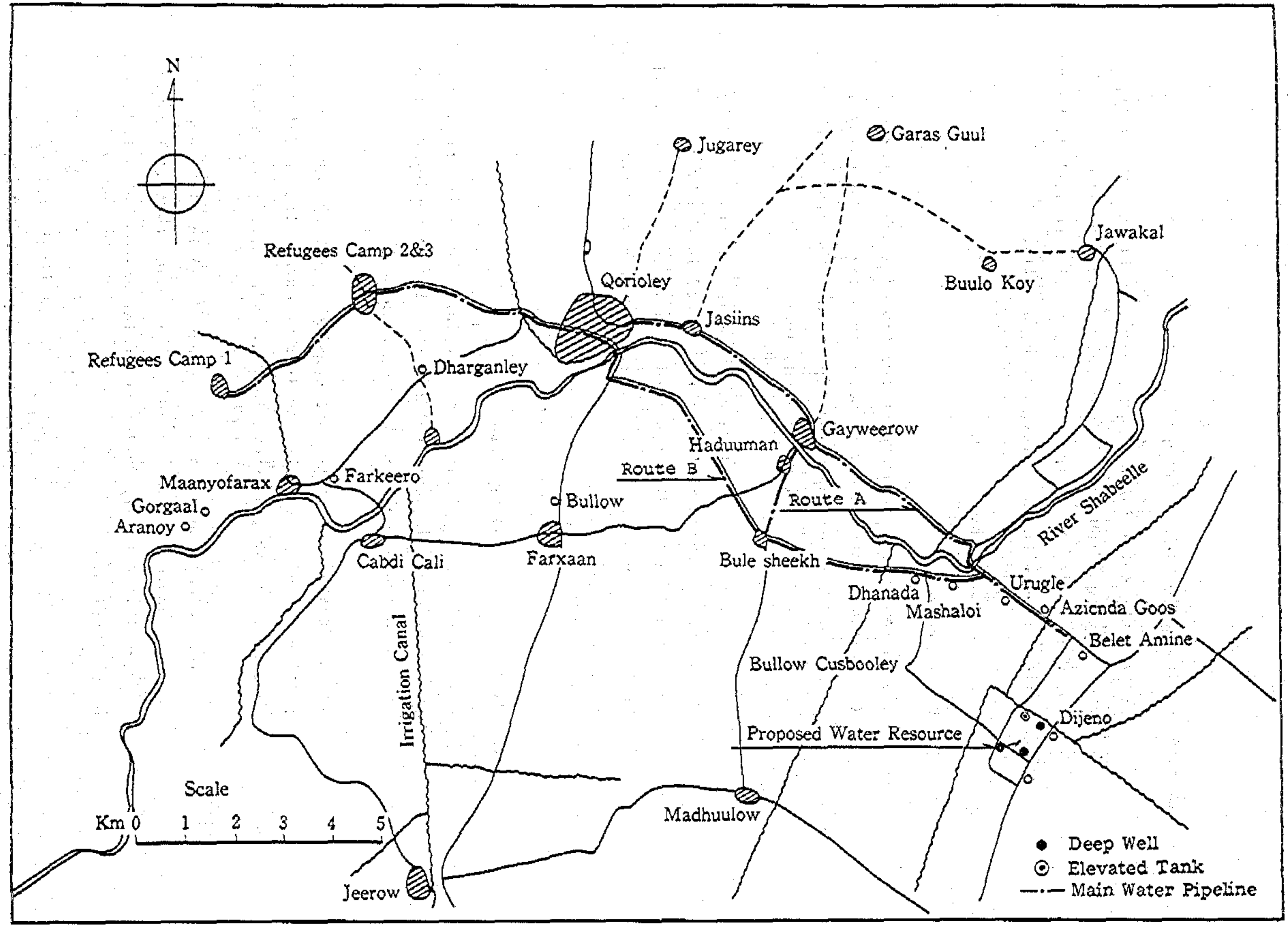


Fig. 4-12 Study of Main Pipe Line



4-2-10 Water Supply Time

At present, the refugee camps provide restricted water supply from 6:00 to 18:00, and in Qoryooley Town from 7:00 to 17:00. The Project has fixed the water supply time to 7:00-17:00 upon deliberation with the Government of Somalia.

4-2-11 Water Pressure

The current water pressure at the tap of a public water filling station, both in the refugee camps and in Qoryooley Town, is 0-2 m. The corresponding figure for the Project shall be 0.5-2 m, and its outline is shown in Fig. 4-10.

The terminal water pressure of the main pipeline shall be 10 m. Every village which is indirectly served in the Project shall be included in the direct served area in the extension of the Project, in future. These villages shall have a water pressure of 5 m.

4-2-12 Water Transmission Pipeline

Main pipelines shall preferably be laid along the shoulder of the existing roads, particularly from the viewpoint of protection of pipes as well as their maintenance.

In the Project two routes are considered for the main water pipeline leading from the possible resource site at Beled Amin to Qoryooley Town, as shown in Fig. 4-12, i.e. Route A and B.

The road along Route A remains unpaved and is also lower than the surrounding farming fields. This means that it becomes inaccessible not only during the rainy season but after minor precipitation.

The road along Route B is paved with asphalt and higher than its surroundings, and can be judged to be in a more favorable condition, particularly from the viewpoint of protection of the pipeline and maintenance thereof. Furthermore, the area along this route is more inhabited than the other, allowing the constructed water supply arrangement to serve more people. Accordingly the Project has decided to select Route B.

4-2-13 Availability of Existing Facilities

All facilities which have been used in the three refugee camps and Qoryooley Town shall be kept in operation in parallel with the execution of the Project except when the water is not available from River Shabelle during the dry season. Those facilities shall supply water to the existing public water filling stations and to the individually served areas, which shall be put in commission during the dry season with a connecting conduit leading to clear water reservoirs in the case of camps and with a connecting conduit leading to the existing elevated tank in the case of Qoryooley Town.

The conceptual drawings of co-ordination of existing facilities with those to be constructed according to the Project, are shown in Fig. 4-13, 4-14.

4-2-14 Possibility of Future Extension

For the villages, 16 - 24, as in Table 4-5, which are indirectly served by the Project, only the necessary water quantity and pressure (5 m) are secured for each indirect served village so as to allow another project in future to extend their respective arrangements. As far as the Project is concerned, people of each village are required to fetch water from their donkey cart filling station installed at a point on the main water pipeline. This point will become, in future, a divergent point for the pipeline leading to their village (Fig. 4-15).

Fig. 4-15 Expansion Plan for Future

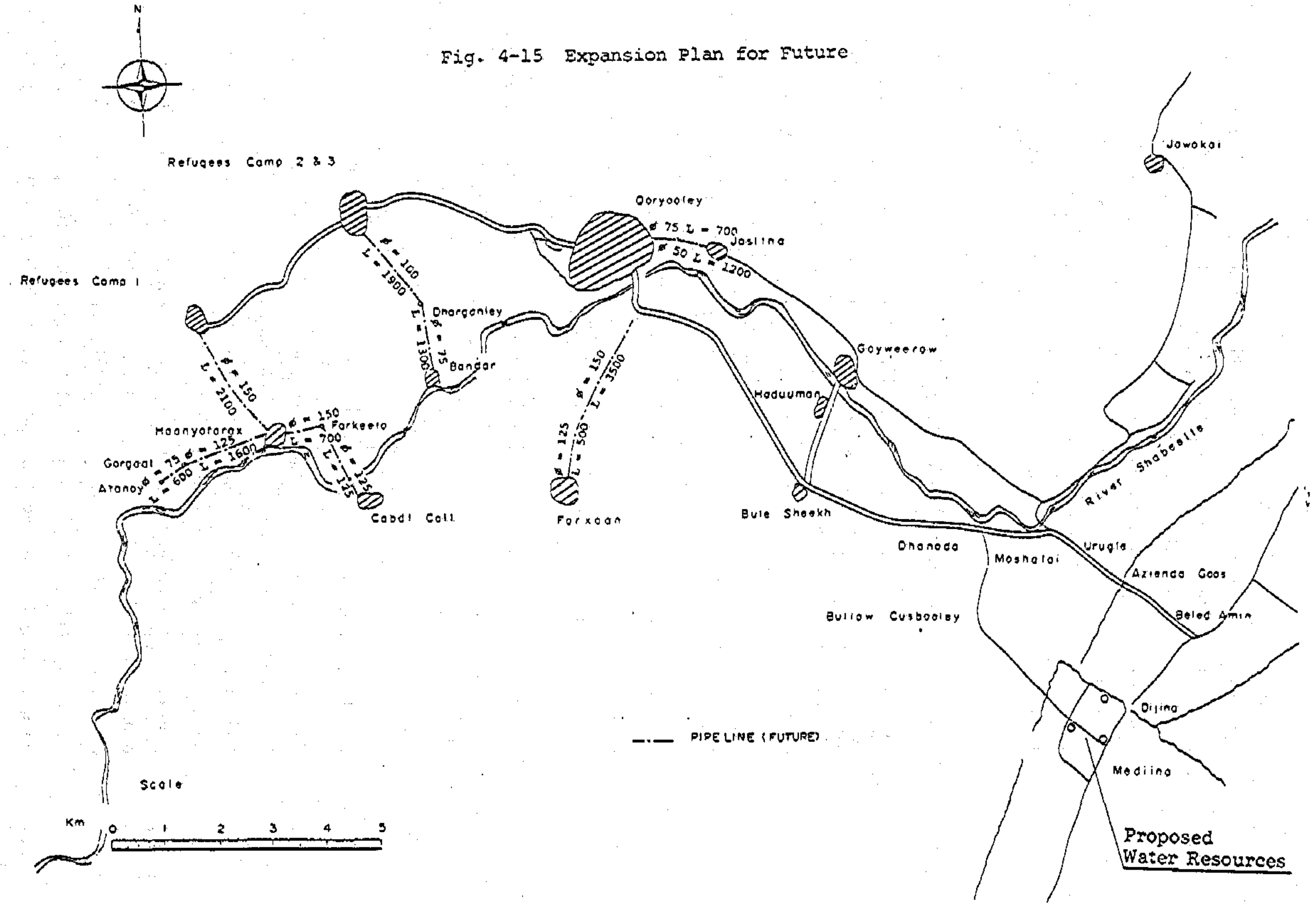


Fig. 4-13 Relation between Existing Facilities and New Facilities (Qoryooley Town)

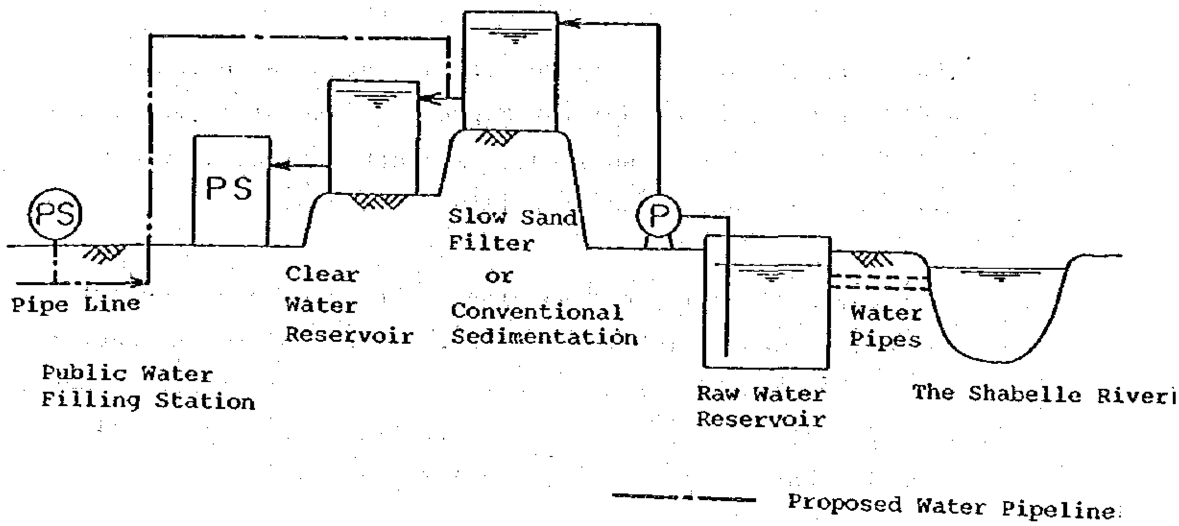
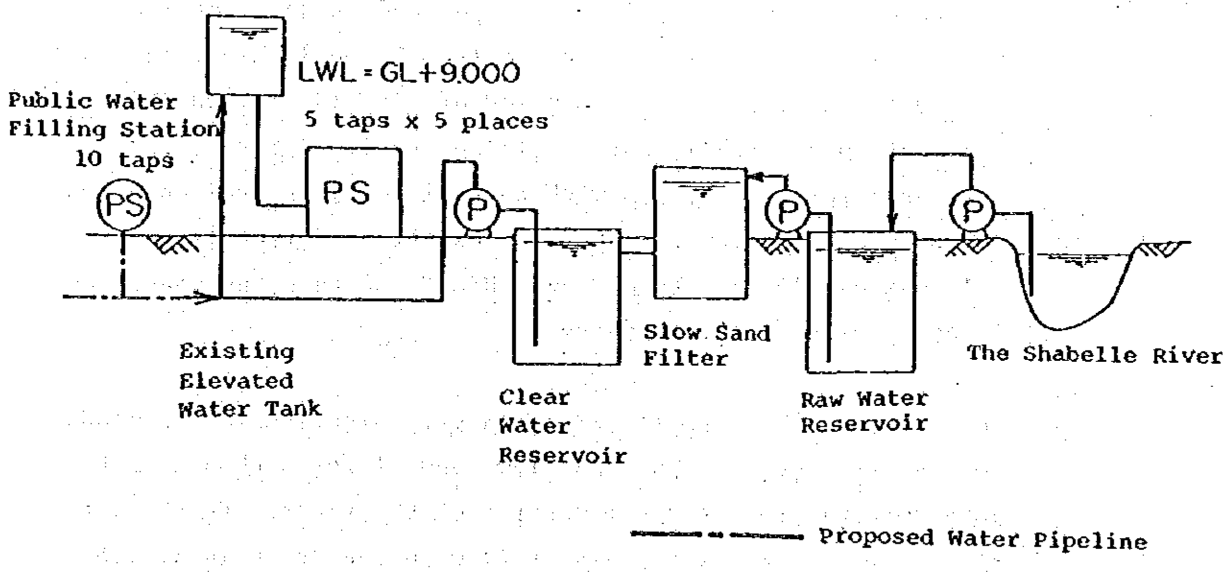


Fig. 4-14 Relation between Existing Facilities and New Facilities (Refugee Camp)



4-2-15 House Connection

House connection has been arranged only at Qoryooley Town for 60 households and 20 public facilities.

The National Water Supply Decade aims at at a increase of individual services of 50% for Mogadish, 40% for major cities and 30% for minor urban areas. All other areas should be supplied through public water filling stations.

Thus the Project intends to arrange house connections only to Qoryooley Town, which is considered to belong to the abovementioned minor urban areas, and the target share there is accordingly 30%. All other areas served by the Project shall be supplied through public water filling stations.

4-2-16 Water Supply System

The Qoryooley Water Supply Project by WHO, 1981, consists of a system in which the raw water taken from the Shabelle River is subjected to water treatment composed of natural settling sedimentation and slow sand filter and sent to the public water filling station (partially house connections). Water supply to the camps provided in 1981 is operated on self-service system, in which the raw water taken from Shabelle River is subjected to water treatment composed of Coagulo-sedimentation and sent to the public water filling stations, but camp 2 changed later to a system with natural settling sedimentation and slow sand filter, in the same manner as Qoryooley Town. This was carried out by WHO and UNICEF, because the coagulant is not easily available there.

Turbidity of the Shabelle River is very high and its suspended solids are fine, so that the slow sand filter method is not very suitable to treat the water from the river. Further, the river suffers from shortages of flow in the dry season, i.e. December through March.

The existing information and site surveys available at this time indicates that the Beled Amin area, 15 km away from Qoryooley Town, can offer a good quality groundwater in a considerablly larger quantity.

There are two possible alternatives for the water transmission system, the direct pumping system, and the gravity system which consits of pumping water once to an elevated tank and then letting it flow naturally by gravity. The direct pumping system is not regarded as appropriate for the Project however, because there is the danger of water hammer occurring due to the long pipeline length, large variations in the amount of water being conveyed, many crossings of channels, etc., in addition to the high technical level required for operation and maintenance of this system. Therefore, the system to be adopted in the Project is decided after examining two possible alternatives, the system in which water is pumped from the well to the elevated tank and transmitted by gravity to the ends of the waterworks, and the system provided with a relay elevated tank, in connection with the structure, hydraulics, operation and maintenance, economical efficiency and other relevant aspects. (The economical efficiency of these alternatives is examined in Annex-13).

As for economical efficiency, Case (1) consisting of a system provided with a relay elevated tank is more advantageous. On the other hand, from the standpoint of operation and maintenance, the system without a relay elevated tank, in which the well pump is the only equipment requiring maintenance and operation, is more advantageous in view of the operation and maintenance capability of the local people, availability of parts and other relevant aspects. In reality however, the latter alternative requires a higher elevated tank for carrying out economical transmission of water because it is not provided with relay elevated tank facilities. In this connection, it must be borne in mind that the construction of a very high elevated tank (GL+30m or more) is not advantageous from the structural and workability stand points and also there is the existence of many uncertainties regarding such aspects as conditions of the ground, work execution capability of local contractors, earthquake, wind and other natural conditions involved. In view of the aforestated considerations, and taking into consideration the work execution capability of the local contractors, the operation and maintenance capability of the local people, the availability of spare parts and other relevant factors, it is concluded that the system of Case (2) is regarded as the most appropriate for the Project. The said system is not provided with relay elevated tank facilities, the elevated tank height is GL+30m, the peak cut capacity is 6% of the daily maximum water supply amount, and the maximum time coefficient required for designing the well pump capacity and the pipeline is 1.16 (Comparison List: Fig. 4-8).

4-2-17 Elevated Tank Capacity and Maximum Time Coefficient

As mentioned in Section 4-2-16, the design conditions for determining the optimum scale of the Project assumes that the capacity of the elevated tank and the public water filling stations will be 6%of the daily maximum water supply amount, and that the maximum time coefficient required for the hydraulic examinations for determining the pump capacity, pipeline diameter, elevated tank height and other relevant parameters is 1.16.

4-2-18 Summary of Basic Items

(1) Target year: 1990

(2) Served area and population

3 refugees camps, villages around them located along the Shabelle River, and villages along the main water pipeline connecting Beled Amin as water resource to the refugee camps.

The estimated served population to be covered by the Project when target year is achieved is calculated from the nominal population given by the site investigation, 1984, and the rate of population increase is assumed to be 3.4%. Increase of dwellers in the camps is assumed to be 300 heads annually.

Directly served area

3 camps, Qoryooley and 11 villages with a total population of 96,270

Indirectly served area

9 villages with a population of 31,500

(3) The water resource shall be taken from groundwater at the Beled Amin area.

(4) Daily water consumption per head is assumed to be 15ℓ/day. Public water consumption is assumed to be 5.5% of the daily domestic water consumption, and water loss is assumed to be 10% of the daily water consumption.

(5) Water supply time shall be 10 hours from 7:00 A.M. to 5:00 P.M.

(6) Water supply Amount:

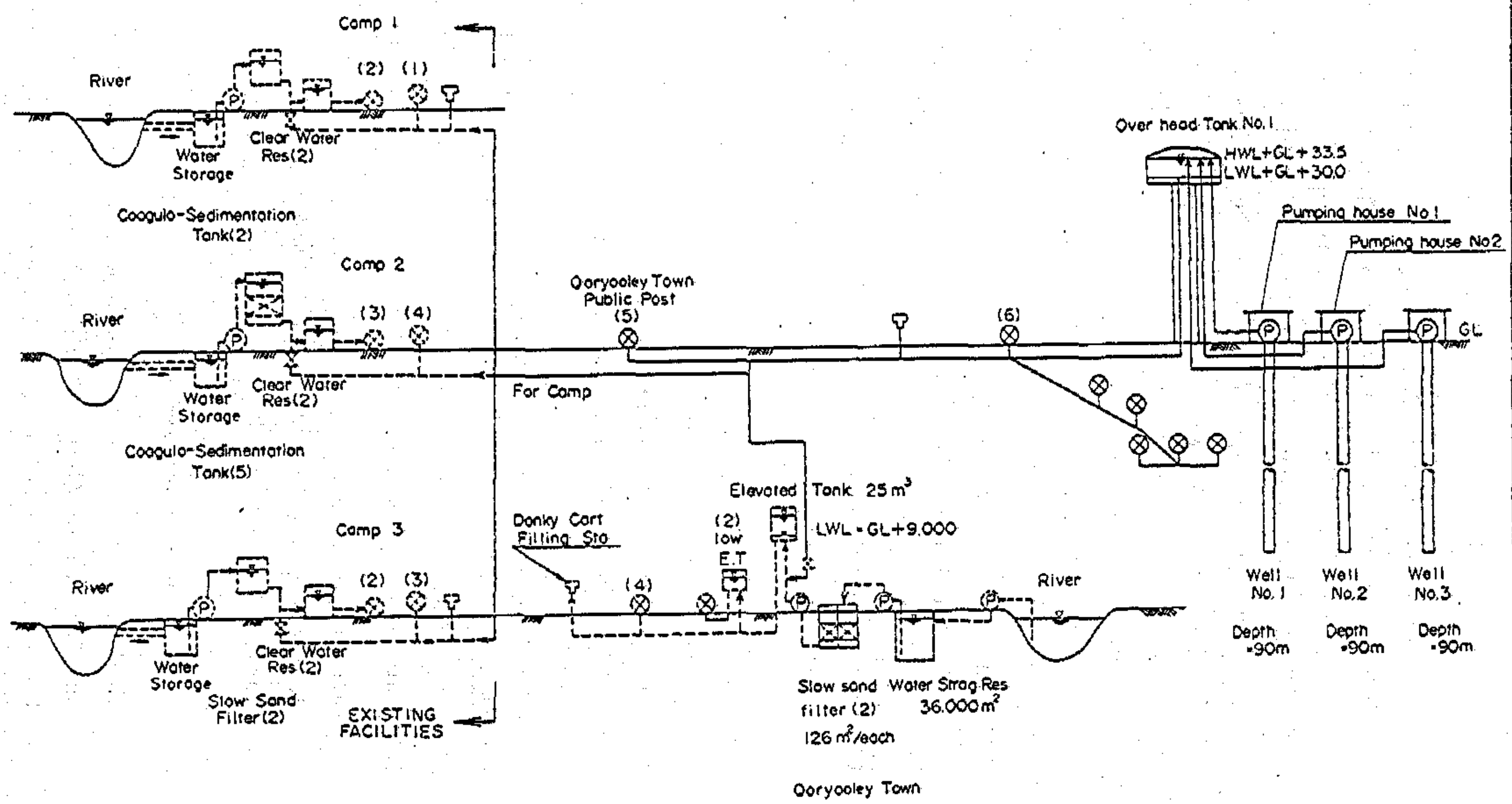
Directly served area	1,683.1 m^3
Indirectly served area	540.5 m^3
Total	2,223 m^3/day

(7) Water transmission system

The water is lifted by a well pump up to an elevated tank, and from there flows naturally by gravity to the feed lines. Provision of a relay tank will be further considered from the economical point of view.

Conception Figure shows above systems (Fig. 4-6).

Fig. 4-16 Conception Figure of the Project
( ) : No.S



CHAPTER 5

BASIC DESIGN OF WATER SUPPLY FACILITIES

CHAPTER 5 BASIC DESIGN OF WATER SUPPLY FACILITIES

5-1 Water Resource Facility

(1) Assuming that the maximum time coefficient is 1.28 to determine the water intake capacity, the planned amount of water intake is:

$$2{,}223.6\ m^3/day \times 1/10\ hr/day \times 1.16 = 258\ m^3/hr$$

(2) Number of wells

Since it seems to be possible to take water at a rate of 150 m^3/hr or higher as indicated by the water pumping test of the existing wells, the well capacity is determined at 129 m^3/hr and the number of wells at 3 including a well for reserve purpose only. If one of them is in operation, its intake amount is 129 m^3/hr, corresponding to only 58% of the actual average water supply of 222.3 m^3/hr. Because the rate of water supply varies from time to time, 7 hours of the planned pumping operation time of 10 hours a day, should presumably be in full capacity operation. That is why a reserve well is required.

(3) Depth of well

It is determined that L-90 m is sufficient as indicated by an estimated Hydro-geological cross section of Beled Amin.

(4) Diameter and material of casing pipe

The casing pipe diameter shall be 300 mm because the difference between the inner diameter of the casing pipe and the outer diameter of the submerged motor pump must be larger than 20 mm for achieving the planned water intake amount. The pump size for the planned water intake amount and results from the water pumping test of existing wells were also taken into consideration for the decision. The material shall be resin, since corrosion due to saline components must be taken into consideration.

(5) Length and apperture of screen

The volume of water (q) to be taken from one meter of aquifer is given by area (A) of one meter of aquifer multipled with the apperture (N) of strainer and flow limit velocity (V). Necessary length is obtained by dividing water intake amount by this quantity.

Assuming

$A = 2\pi r = 2 \times 3.14 \times 0.15 = 0.942\ m^2$,

$N = 15\%$ and $V = 1.5\ cm/sec = 54\ m/hr$,

Q is given by $0.942 \times 0.15 \times 54 = 7.63\ m^3/hr$.

Therefore

$$\ell = \frac{129}{7.63} \times 1.2 = 20.2\ m = 20\ m$$

(6) Location of well

Wells are located as shown in Fig. 5-1 to select an adequate distance between wells so that they do not affect the existing wells and cause mutual interference. The present status of land utilization of the site was also taken into consideration.

(7) Well drilling diameter

Wells shall have a drilling diameter large enough so that uniform distribution over geological strata may be achieved for thickness of gravel packing material and flow rate at the entering point at screen. At least 70 mm is required between the screen surface and well wall.

Denoting the diameter of casing pipe as D, the drilling radius R is calculated as follows.

$$
\begin{aligned}
R &= (1.5 \sim 3)D \geqq 140 \text{ mm} + D \\
&= (1.5 \sim 3) \times 300 \geqq 140 + 300 \\
&= 450 \sim 900 \geqq 440
\end{aligned}
$$

("Practical deep well engineering"
by Yutaka Fukukawa, 1969)

The drilling radius shall be as large as possible because it governs the flow rate of groundwater. R = 500 mm is chosen here.

(8) Well drilling method

The rotary method is advantageous because the aquifer is situated in a gravel layer.

(9) Pump for well

The pumps shall be as follows, because the pumping rate of each well is 129 m^3/h (2.15 m^3/min) and the head is 64.5 m.

- No. of units	3 (including one stand-by unit)
- Pumping rate	2.15 m^3/min
- Head	64.5 m
- Caliber	ϕ200
- Engine power	70 PS

Fig. 5-1 (1) Location of Wells

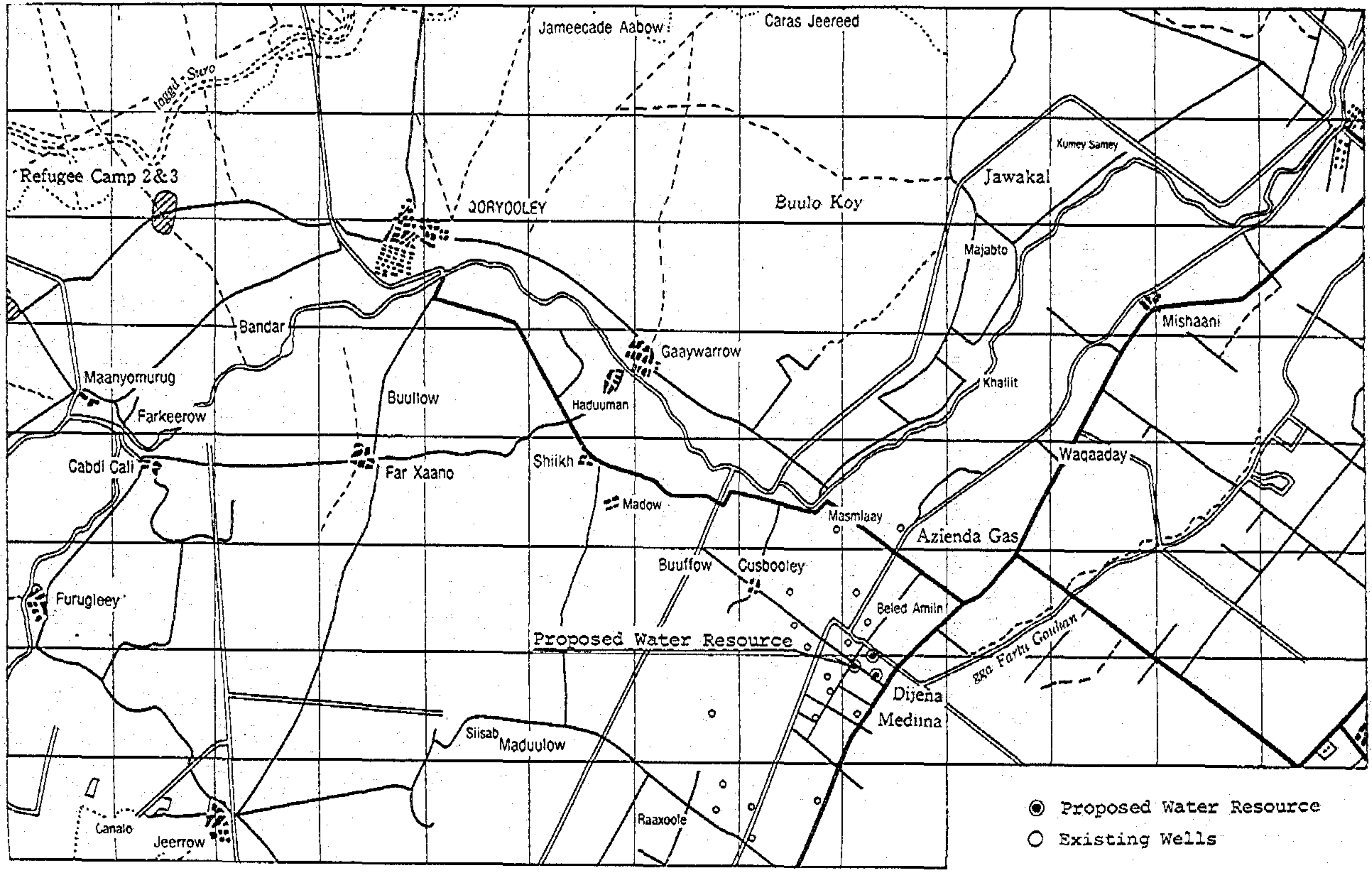
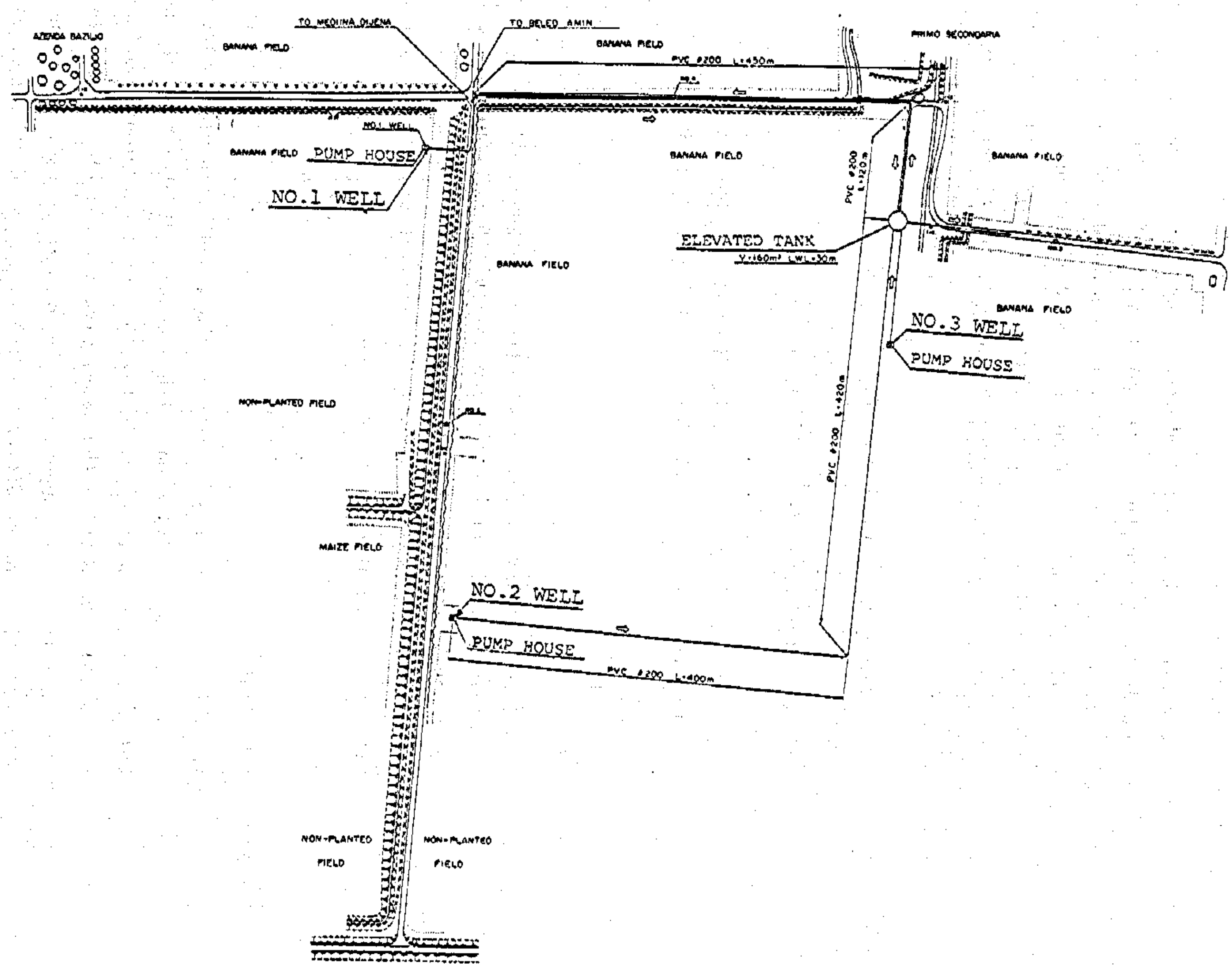


Fig. 5-1 (2) Proposed Location of New Wells



5-2 Elevated Tank

5-2-1 Scale

The elevated tank is designed with a capacity equivalent to 6% of the daily maximum supply amount in view of the considerations of Section 4-2-17. Furthermore, the elevated tank will be provided with an allowance of 20% to cope with the operation followability of this system, by taking into consideration the fact that it is manually operated. Therefore, the elevated tank capacity is:

$$2.223\ m^3 \times 0.06 \times 1.2 = 160\ m^3$$

- Elevated tank capacity: 160 m^3

- Dimensions: ID ϕ9.6 m x Effective water depth 3.5 m
  Height: HWL = GL + 33.5 m LWL = GL + 30.0 m

5-2-2 Structure

As a result of the comparative study of various alternatives of the elevated tank structure shown in Table 5-1, reinforced concrete shall be employed in the Project in view of the advantages, such as small costs of materials transportation, high durability and ease of operation & maintenance.

5-2-3 Foundation

The ground at the Project site is clay, and it is presumed as a result of tests carried out with a cone-penetrator that the N-value is 18, down to approximately 5 m from the ground surface (Annex-14). Such being the case, direct foundation is regarded to be sufficient to support the elevated tank load. (Examined in Annex 19). The conditions of the ground at depths exceeding 5 m are not known however, because no boring test has been carried out. Seismic force is not taken into consideration, in conformity with the Somalian construction standards, but cast-in-place concrete piles are taken into the design agaist the reversing by holizontal stresses assuming wind pressure three times as high as actual recorded value for safety factor.

Table 5-1 Comparison List of Elevated Tank

Item	Steel	F.R.P.	Reinforced Concrete
Construction Materials	Import of construction Materials machined in advance	Importation from Japan Expensive compared with steel	Available on the local market, except cement and reinforcing bars
	X	X	O
Watertightness	• No risk of water leakage when welded. • Waterproofing required when bolted	Packing is provided at the joints, but waterproofing is desirable in the long range	Waterproof mortar and resin waterproofing treatment are required
	△	△	△
Term of Works	Short term of works because steel members are assembled by welding or bolting	Short term of works because members are assembled by bolting	Assembly and disassembly of rorms, timbering and scaffolding, as well as concrete placing and curing require long term of works
	O	O	△
Maintenance and Administration	Periodic internal and external painting is required for corrosion protection	The product it self is submitted to corrosion protection treatment	No painting is required for corrosion protection
	X	O	O
Water Temperature	Influenced by external atmospheric temperature, direct heating, etc., compared with reinforced concrete	Influenced by external atmospheric temparature, direct heating, etc., compared with reinforced concrete	Influence of external atmospheric temperature, direct heating, etc., not so conspicuous
	X	X	O
Construction Cost	Japanese welders will be required when assembling members by welding. When assembling members by bolting, one Japanese S.V. will be efficient, but this alternative can not be regarded as unconditionally cheaper if the sea freight, land freight, etc., are taken into consideration	Japanese S.V. required. This alternative can not be regarded as unconditionally cheaper if the sea freight, land freight, etc., are taken into consideration	No specialized Japanese S.V. will be required if carried out simultaneously with other construction works. The construction cost itself is more expensive compared with the 2 other alternatives, but it can not be regarded as unconditionally expensive because it does not require freight and other costs
	X	X	O

5-3 Water Pipeline

5-3-1 Type of Pipe

Ductile cast iron pipe, painted steel pipe, PVC pipe, and FRP pipe are the possible alternatives of pipe types that can be used in the Project. However, PVC pipes shall be used for diameters under ϕ300 mm, and FRP pipes shall be used for diameters above ϕ350 mm, in view of the results of the comparative study of the said types (examined in Annex 12).

Steel pipes or ductile cast steel pipes shall be used at special places. (e.g. when crossing rivers, rising pipes of elevated tank)

5-3-2 Pipe Diameter

The pipe diameter is determined on the basis of hydraulic examination with respect to the design flow, based on the distribution of hourly water supply amount calculated by assuming a 6% peak-cut capacity and a maximum time coefficient 1.16 in the system without a relay elevated tank which has the optinum Efficiency (from Annex-14), the internal pressure and other factors and also with due consideration to future expansion programs. The results of hydraulic expansion, are as shown in Fig. A14-8 (1) of Annex-14 and the pipe cabibre is shown in Fig. A14-8 (2).

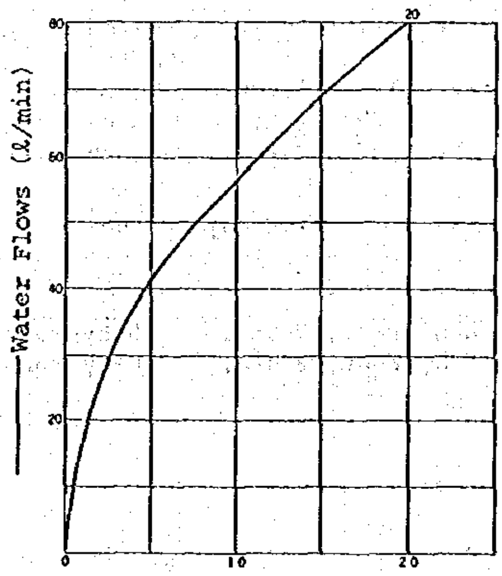
5-3-3 Pipeline Accessories

Air valves, scour pipe discharge, valves and other accessories shall be properly installed at vertical bends of the pipeline. (e.g. when crossing the Shabelle River, when crossing the irrigation chanels, etc.)

5-4 Hydrants and public water supply station

Fig. 5-2 shows flow rates of a 20 mm hydrant. As the internal pressure of a hydrant is 0.5 - 2.0 m (1.25 m average), water supply rate of a hydrant is 19 ℓ/min (11.4 m^3/day) at the public water filling station. Assuming the moving factor as 50%, population to be served is 0.5 x 11.500 ℓ/day ÷ 15 ℓ/person/day = 380 person/hydrant. Therefore, the number of hydrants to be installed in the planned area is 127,770 ÷ 380 person/hydrant = 336 hydrants. By subtracting the water supply rate of 24 m^3/day for house connections and 540.5 m^3/day to be supplied at donkey cart filling station, totaling 564.5 m^3/day (equivalent to water supply for 32,896 persons), the number of hydrants to be installed is 94,874 (127,770 - 32,896) persons ÷ 380 person/ hydrant = 250 hydrants. Existing water supply facilities include 10-hydrant stations at two locations in Refugee Camp 1, five 10-hydrant stations in Refugee Camp 2, two 10-hydrant stations in Camp 3 and six 5-hydrant stations at Qoryooley Town. However, only six stations at Qoryooley Town shall be used and the Project shall be constructed at 26 locations, which include 2-hydrant stations at seven locations, 5-hydrant station at a location, 7-hydrant stations at 2 locations and 10-hydrant stations at 16 locations. These stations shall be equipped with a reservoir tank having a storage capacity for peak cut corresponding to 6% of each average demand.

Fig. 5-2 Water Pressure to Flow Chart



5-5 Description of water supply facilities

Water supply facilities

Area to be served	Direct water supply area --- 3 refugee Camps, Quryooley Town, and villages Indirect water supply area -- 9 villages
Population to be served	Direct water supply area -- 96,270 Indirect water supply area -- 31,500 127,720
Daily maximum water supply	Direct water supply area--- 1,683.1 m^3/day Indirect water supply area -- 540.5 m^3/day 2,223 m^3/day
Water source	Groundwater at Beled Amin
Production well	ø 300 x ø 250, Depth 90 m, Water intake rate 129 m^3/hour 3 wells (including a standby)
Well pump	ø 200 x 2.15 m^3/min. x 64.5 m x 70 ps x 3 units (including a standby unit)
Pump station	4.4 m x 10.0 m x 3 housings
Overhead Water supply tower	Effective capacity 160 m^3 (inner diameter 9.6 m x effective depth 3.5 m) Height HWL = GL + 33.5 m LWL = GL + 30.0 m A tower
Water intake pipe	ø200 x 1,400 m (Ductile cast iron pipe or PVC pipe)
Water supply pipe	FRP ø400 x 16,840 m (Paved road 13,840 m, unpaved road 3,000m) FRP ø350 x 1,500 m (Unpaved road) PVC ø300 x 4,850 m (Unpaved road) PVC ø250 x 3,650 m (Unpaved road)
Water distribution pipe	ø50 - ø150 PVC pipe 7,780 m
Large water supply station	3 stations
Public water supply station	2-hydrant, 7 stn. 5-hydrant, 1 stn. 7-hydrant, 2 stn. 10-hydrant, 16 stn.

5-6 Estimated Project Cost

The Project cost shall be calculated as of July 1985, and the exchange rate to be used in this connection shall be US$1 = 83.6 Somai Shilling = 237 Yen (1 Somali Shilling = 2.83 Yen).

In implementation of the Project, the Government of Somalia shall also bear a part of the Project cost. Some of the costs to be borne by the Government of Somalia are the following:

(1) Land acquisition cost — Somali Shilling
(— Yen)

(2) Gravel laying cost on the rural roads to be used as a pipeline route 5,830,000 Somali Shilling
(16,500,000 Yen)

(3) Custom duty and other expenses on the materials and equipment to be imported from Japan
164,696,000 Somali Shilling
(466,091,000 Yen)

(4) Cost of facilities and equipment for operation & maintenance
2,959,000 Somali Shilling
(8,375,000 Yen)

CHAPTER 6

PLAN FOR OPERATION AND MAINTENANCE

CHAPTER 6 PLAN FOR OPERATION AND MAINTENANCE

6-1 Organization

6-1-1 Existing Organization for Operation and Maintenance

As described in 2-3-2, the water supply service for entire Somalia is operated by WDA (which consist of a head office and extensions in 16 regions Fig. 2-5), except in the three cities of Mogadishu, Kosmayo and Hargeisa.

For refugee camps RWSD, as an organ of WDA in charge of refugees camps, is managing the North West district and South district by its divisions, NWRWSD and SRWSD respectively.

The water supply service in Qoryooley is the only facility in the proposed area and managed by WDA in Shallambood. Organization of WDA in Shallambood is shown in Fig. 2-5. Six operators are stationing at the water supply facilities in Qoryooley Town.

In addition to the above staff, a civilian is working as a charge collector at each of seven stations under contract.

6-1-2 New Organization

The organization for operation and maintenance of new facilities shall incorporate not only sections to operate and maintain the new facilities but those which will give instructions or enlighten people about the effective utilization of facilities conducive to improved living standards and environment.

In order for the new facilities to be stably utilized for a long time and to contribute to steady and safe distribution of water for living and to improved living standards, the organization shown in Fig. 6-1 is required as a minimum. It will be sufficient for the Project purpose to improve and strengthen the existing organization (Fig. 6-3) as it is currently intended for operation and maintenance of facilities in Qoryooley Town (Fig. 6-2) and 3 refugee camps.

The management of the water supply shall be meant not only for collection of charges but also for the accumulation of basic data for the sound operation of the facilities.

Fig. 6-1 Organization for Management and Operation of the Water Supply Facility

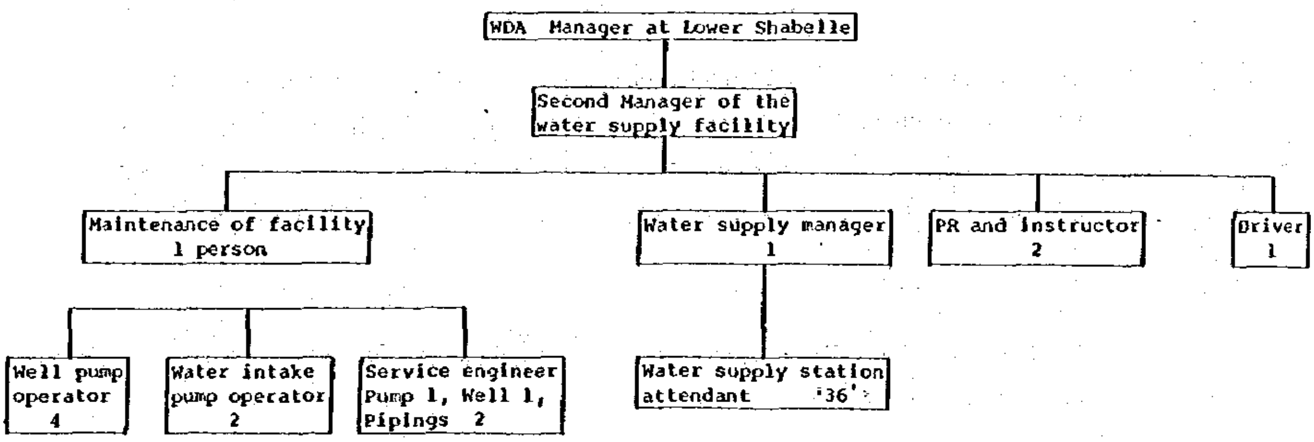


Fig. 6-2 Organization for Management and Operation of the Qoryooley Town Water Supply Facility

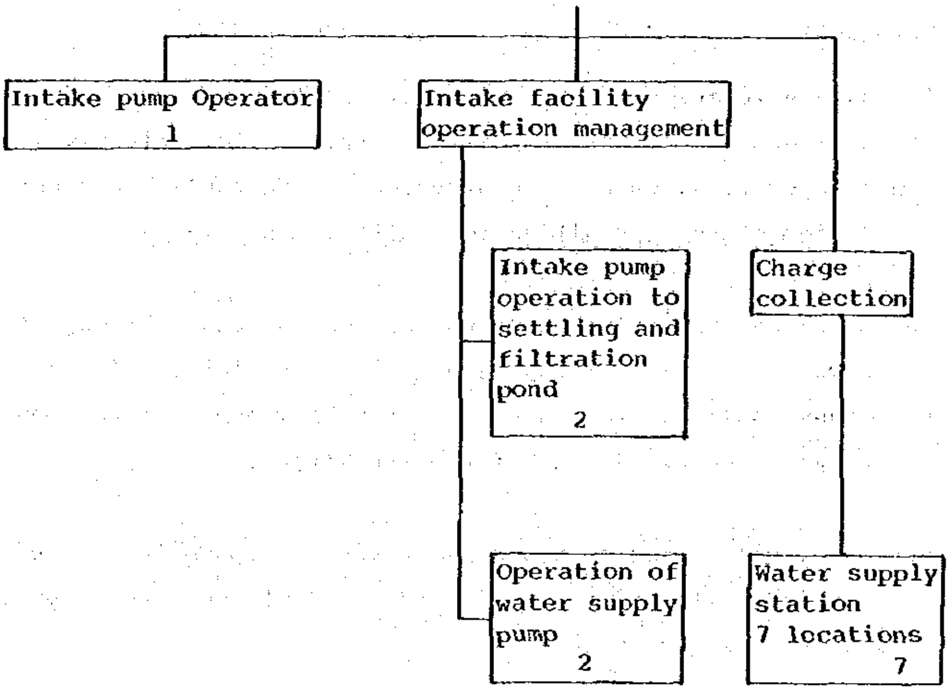
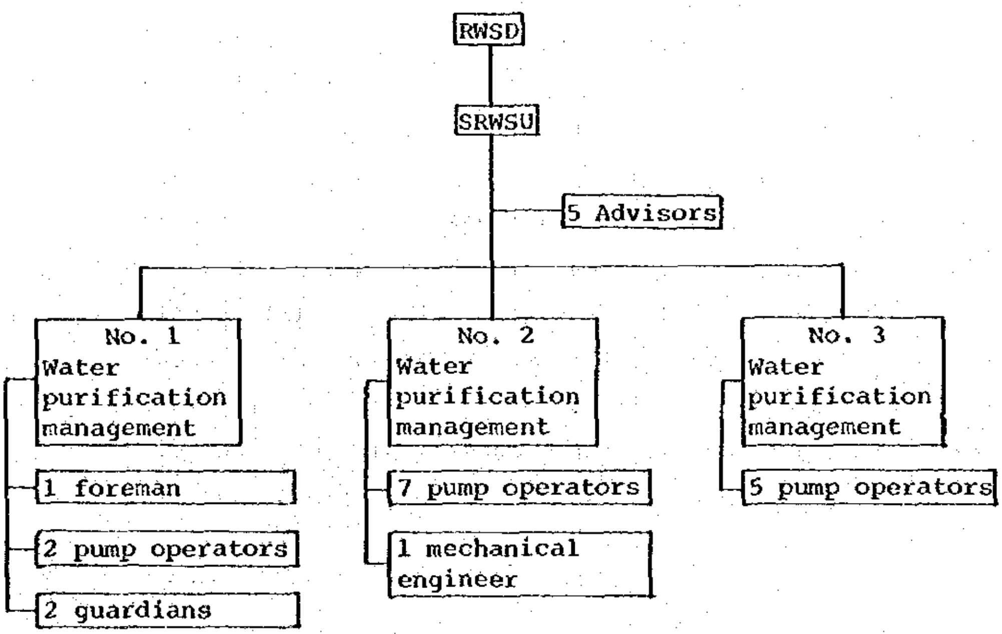


Fig. 6-3 Organization of Management and Operation of Water Supply Facilities at Refugee Camps



6-2 Personnel

Adequate allocation of operating personnel of water supply facilities is one of the most significant factors for effective and stable operation, which of course includes establishment and consolidation of the facilities to a satisfactory level.

Personnel for the maintenance and management shall be experts or staff with education or experience in these fields. At the same time they shall be trained on-site for know-how of management at the stage of commissioning of the facilities.

Personnel allocation in the organization as shown in Fig. 6-1 is reasonable in view of the scale and level of the water supply facilities being planned.

The six persons in management and the four in maintenance shall preferably be trained by WDA and supported by experienced engineers or properly educated people, while the 30 operators may be people outside the organization, who are left in charge of applicable works as it has been in the past, on the condition that WDA should gradually bring up people who are able to work with the control of the water quantity.

6-3 Operation and Maintenance

Details of operation and maintenance.

6-3-1 Operation of Facilities

Operation of the facilities includes operation of pumps and collection of charges.

(1) Operation management

Demand patterns of served area in the Project are shown in Fig. 4-7 in 4-2-9. Well intake pumps shall be operated in accordance with these patterns utilizing peak-cut capacity (6% of daily maximum water supply amount).
Well intake pumps shall be operated in response to the water levels of the elevated tank, while one unit is always run, another is stopped at the upper limit and then run at the lower limit of the level.

The above operations shall be recorded in a daily log.

(2) Charge collection and management of public water filling stations

The job includes water supply management including data collection of water supply rate and charge collection at 32 public water filling stations (seven 2-hydrant stations, seven 5-hydrant stations, two 7-hydrant stations and sixteen 10-hydrant stations) and four donkey cart filling stations including those existing at Qoryooley Town (6 public water filling stations and one donkey cart filling station). Those in the refugee camps will be managed by other activities. The tasks are entrusted to civilians. It is desirable that they are able to manage the water quantity (including recording of the water supply quantity).

6-3-2 Maintenance of Facilities

The water supply facilities (wells, water intake pumps for well, elevated tank, water trasmission pipeline, water distribution pipes, public water filling stations, etc.) shall be regularly inspected/adjusted and maintained/managed for normal operation.

Standby units are provided with wells, well water intake pumps, etc. They shall be regularly inspected and adjusted under an alternating operation in order to operate normally for long periods of time. Considering that the quality of the salt content in the water supply is higher than that of Japan, ductile cast iron pipes or painted steel pipes are only to be used partly, colored water and water leakage by corrosion are prevented by employing PVC pipes or FRP pipes. Still, careful inspection of pipelines is required to maintain normality of pipelines.

6-4 Costs for Operation and Maintenance

Personnel		(5,892,000 So.Sh/annum)	Yen 16,674,000
Operation and Maintenance			
1)	Fuel and oil	(1,475,000 So.Sh/annum)	Yen 4,171,000
2)	Chemicals	(10,000 ")	29,000
3)	Maintenance for cars	(1,270,000 ")	3,597,000
4)	Articles of consumption	(540,000 ")	1,529,000
	Total	(9,187,000 So.Sh/annum)	Yen 26,000,000

CHAPTER 7

PROJECT IMPLEMENTATION SYSTEM

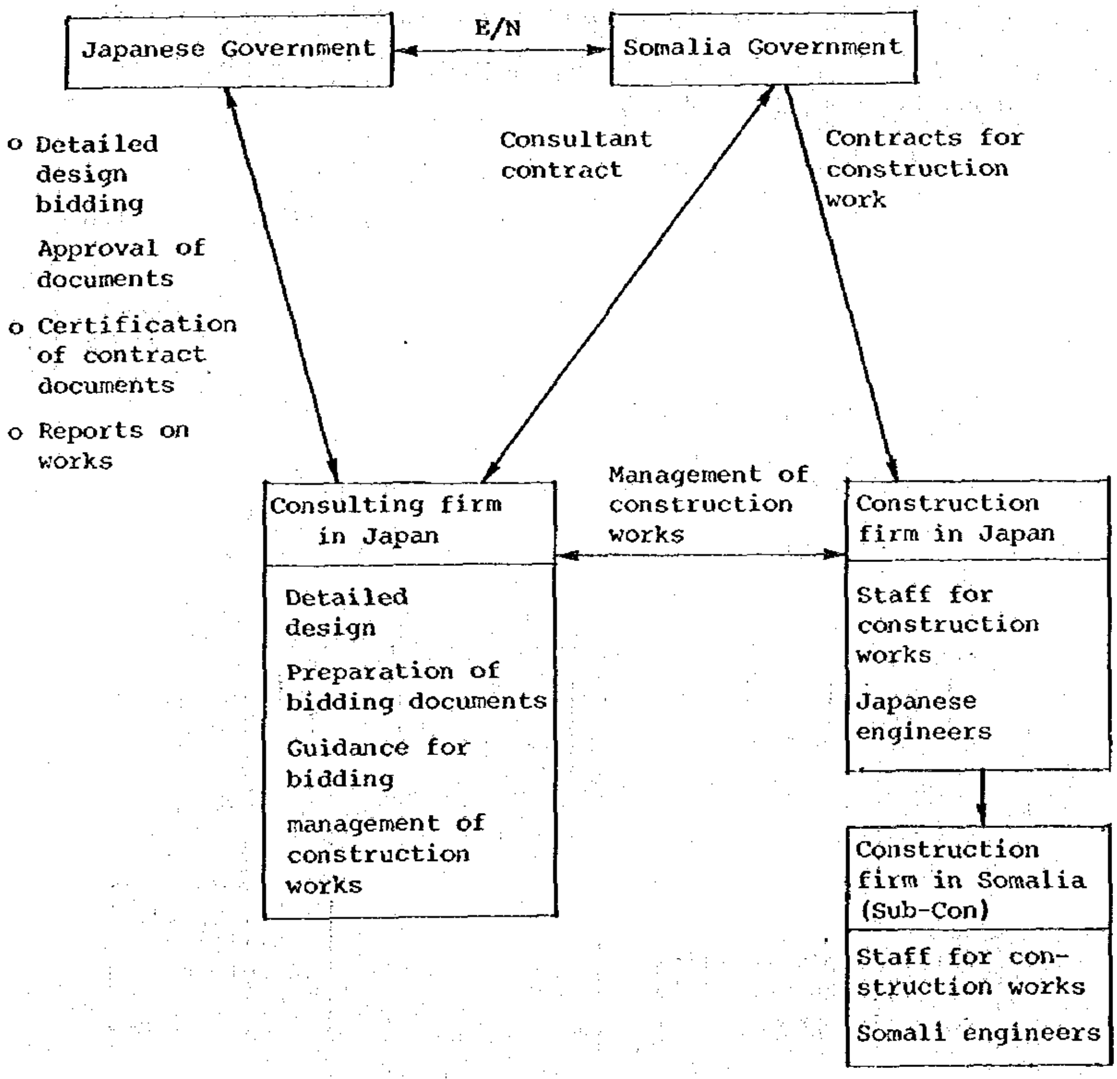
CHAPTER 7 PROJECT IMPLEMENTATION SYSTEM

7-1 Organization for Implementation

7-1-1 Overall relationship

The Project will be implemented by Grant Aid from the Japanese Government.

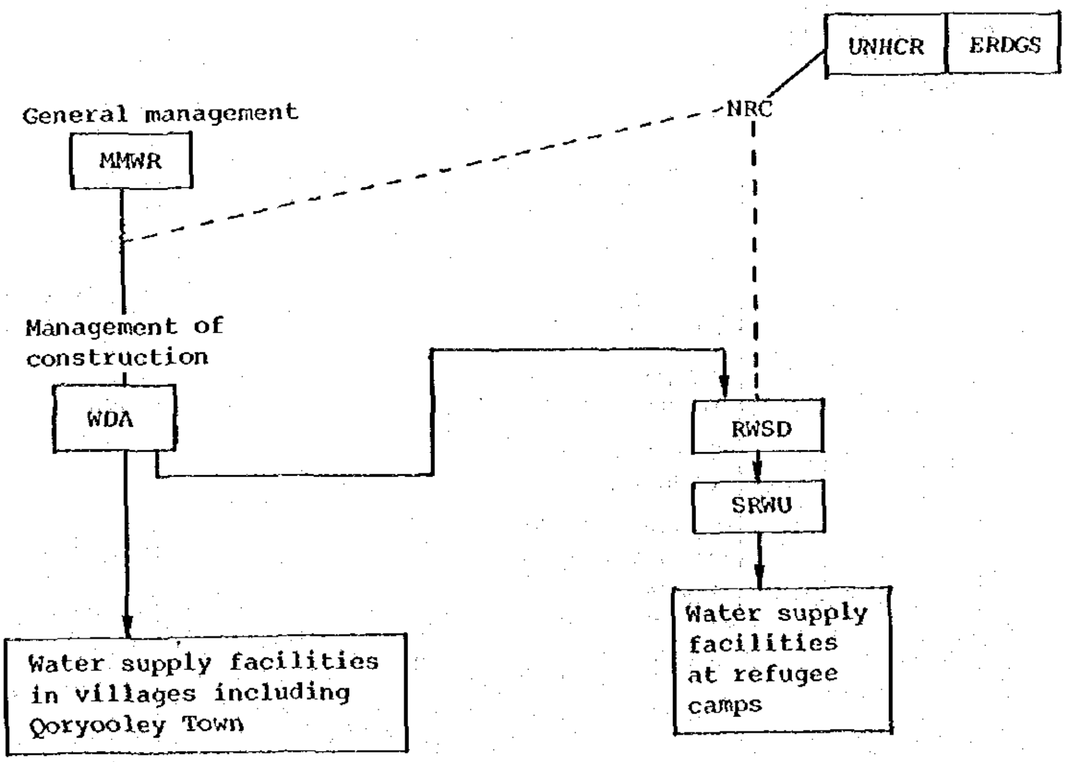
The overall relationship between the organizations concerned may be illustrated as follows:



7-1-2 Somalia's Organizations Involved in Implementation of the Project

WDA shall be responsible for the implementation of the Project under control of MMWR of the Government of Somalia.
In refugee camps RWSD, one of the organizations of WDA shall be incharge of the execution of the project and shall confer with NRC.
The construction site is more than 100 km away from Mogadishu, the Capital. A local office of WDA is located in Shalambood to manage all areas covered by the Project. Therefore, it will act as a contacting point on the site. WDA shall preferably send to the office senior engineers exclusively responsible for close contact with the Japanese consultant and Construction firm and for their management, operation and maintenance thereafter.
Relationships between central and local organizations of WDA is shown in Figs. 2-4 and 2-5.

Fig. 7-1 Implementation Organization of the Government of Somalia



7-2 Execution Plan for the Project

7-2-1 Execution Method

Facilities to be constructed under the Project are:

1. Production well (including water intake pump for well)
2. Elevated tank
3. Water transmission pipeline and water distribution pipes
4. Public water filling stations and donkey cart filling stations

In executing construction for the Project, the turn-key method and the inhouse engineering method may be considered.

Both methods have advantages and disadvantages. The inhouse engineering method requires additional personnel in WDA and also results in an increased workload for the consultant. In view of shortage of WDA's staff, the turn-key method is more favorable. Therefore, the turn-key method is adopted for the Project.

7-2-2 Execution Plan

(1) Production well work

The well shall be excavated by rotary drilling machines.

(2) Elevated tank work

Both foundation and tank shall be made of reinforced concrete. Scaffolds and supporting structures shall be used in the construction. Concrete shall be transported to high working areas with cranes or simplified lifts.

(3) Piping work

Earth excavation work for laying pipeline shall be carried out with a machine. In back-filling and sand laying works, rammers will be used for tamping.

Diameter of pipes shall be ø50mm - ø400mm. PVC pipes shall be used for ø300 mm (8") or less and FRP pipes for ø350 mm (10") or larger.

7-2-3 Period of Construction Works

By taking account of the weather conditions in Lower Shabelle, construction of wells, elevated tank and pipelines shall not be carried out in the rainy season of April - June.

Irrigation channels from the Shabelle River are developed extensively and the underground water level is high in the area. For these reasons, excavation work for foundations and pipe installation are difficult in the rainy season. The implementation of Japanese grant aid has a number of construction limitations in connection with the fiscal year (April - March) in Japan. Therefore, it is necessary to implement the Project by taking full advantages of the dry season for construction.

7-2-4 Period for Detailed Design Study

As stated in 7-2-3, construction shall be carried out in the dry season from July to March, in view of weather conditions in Somalia and the fact that the pipeline is crossing the Shabelle River and water channels at many locations.

Therefore, the execution plan, by which construction is carried out in the dry season, shall be done with careful consideration given to the time required for transportation of materials and equipment.

7-3 Plan for Procurement of Materials and Equipment

The results of a market survey conducted in Somalia indicate that the country relies on imports for the supply of practically all construction materials and equipment with the exception of gravel and sand. The mode of procurement of construction materials for the Project shall be decided by examining two possible alternatives, importing from Japan or importing from third countries, in view of economy, quality, etc.

(1) Reinforcing bars, cement, plywood and wood

Products available on the local market are not uniform in quality and standard because they are imported from Europe, and furthermore it is difficult to obtain a required quantity at a fixed time. As for the prices, they are more expensive than those to be imported from Japan. Such being the case, they shall be imported from Japan, taking into consideration advantages in respect of quality control and cost control. (Refer to Annex-19).

(2) Equipment for wells

So far, many well drilling works have been carried out in Somalia by local contractors, and they have extensive experience in these matters. As for the price, work executed by local contractors will be cheaper than that executed by importing materials and equipment from Japan. Therefore, in view of the achievements and prices of local contractors, the well drilling works shall be executed by local contractors under the supervision of Japanese technical personnel, with equipment and materials leased from local suppliers. (Refer to Annex-19).

(3) Pumps, hydrants, pipes and valves

At present, these materials that are used in Somalia are made in Italy, West Germany and Britain, and each has different standards. Thus, pipes are not compatible with valves, etc. Such being the case, they must be duly machined in order to fit with each other, and other kinds of parts are used as spare parts. It is presumed to be difficult to secure materials required for the Project on the local market, and it is concluded that the purchase of items meeting the design conditions of the Project on the local market is impracticable. Therefore, the said materials and equipment shall be imported from Japan. (Refer to Annex-19).

(4) Construction equipment

There are many joint-venture companies with capital participation with firms of third countries, and there are many construction machines, particularly excavation machines, transportation and loading machines imported from European countries. It is presumed that construction machinery imported from Japan may be rather costly, and may also cause inconvenience in view of maintenance in Somalia. Therefore, it is concluded that leasing them from local companies is cheaper and more convenient for construction. (Refer to Annex-19).

7-4 The Scope of Construction Work

7-4-1 The scop of work to be undertaken by the Government of Somalia.

a. Acquisition of sites for water supply facilities.

b. Procedures for exemption from customs and custom clearance fee for importing necessary materials and equipment for construction works.

c. Required costs of operation and maintenance facilities and equipments.

d. Improvement of roads to be used for works and maintenance (water source approx. 2.7 km away from the National Road).

e. Works for house connections

Item (e) is not included in the costs to be borne by Somalia in this report.

7-4-2 The scope of works to be undertaken by the Government of Japan

a. Construction and installation works for all water supply facilities covered by the Project (production well, pumps, pump houses, elevated tank, water transmission pipeline, water distribution pipes, related facilities to pipelines, public water supply stations and large water supply stations).

b. Ocean freight and insurance charge on construction materials and equipment to be imported from Japan.

c. Costs of detailed design and construction supervision.

7-5 Detailed Design and Construction supervision

(1) Detailed design and tendering

a. Detailed design and preparation of tender documents

The detailed design and preparation of tender documents shall be made on the basis of information and site measurements obtained from the site survey and necessary deliberations to be conducted with the authorities concerned of the Government of Somalia in charge of the Project.

b. Tender and contract

The steps of procedure from the tender to the signing of the contract consists of the tender announcement, acceptance of the applications to participate in the tender, tender explanation section, issuance of the tender documents, bidders fixed tendering period, examination of the tender documents immediately after their acceptance and then signing of the contract between the successful contractor and the Government of Somalia.

(2) Construction supervision

a. Construction supervision in Japan

This project enters the construction supervision stage as a result of the signature of the contract between the MMWR of Somalia and the Japanese contractor. Immediately after the signing of the contract the consultant will carry out the procedure for approval of the drawings on behalf of the WDA of Somalia in order to make possible the soonest implementation of the Project. Furthermore, the procurement of materials and equipment in Japan will be supervised as well, with the participation of the consultant.

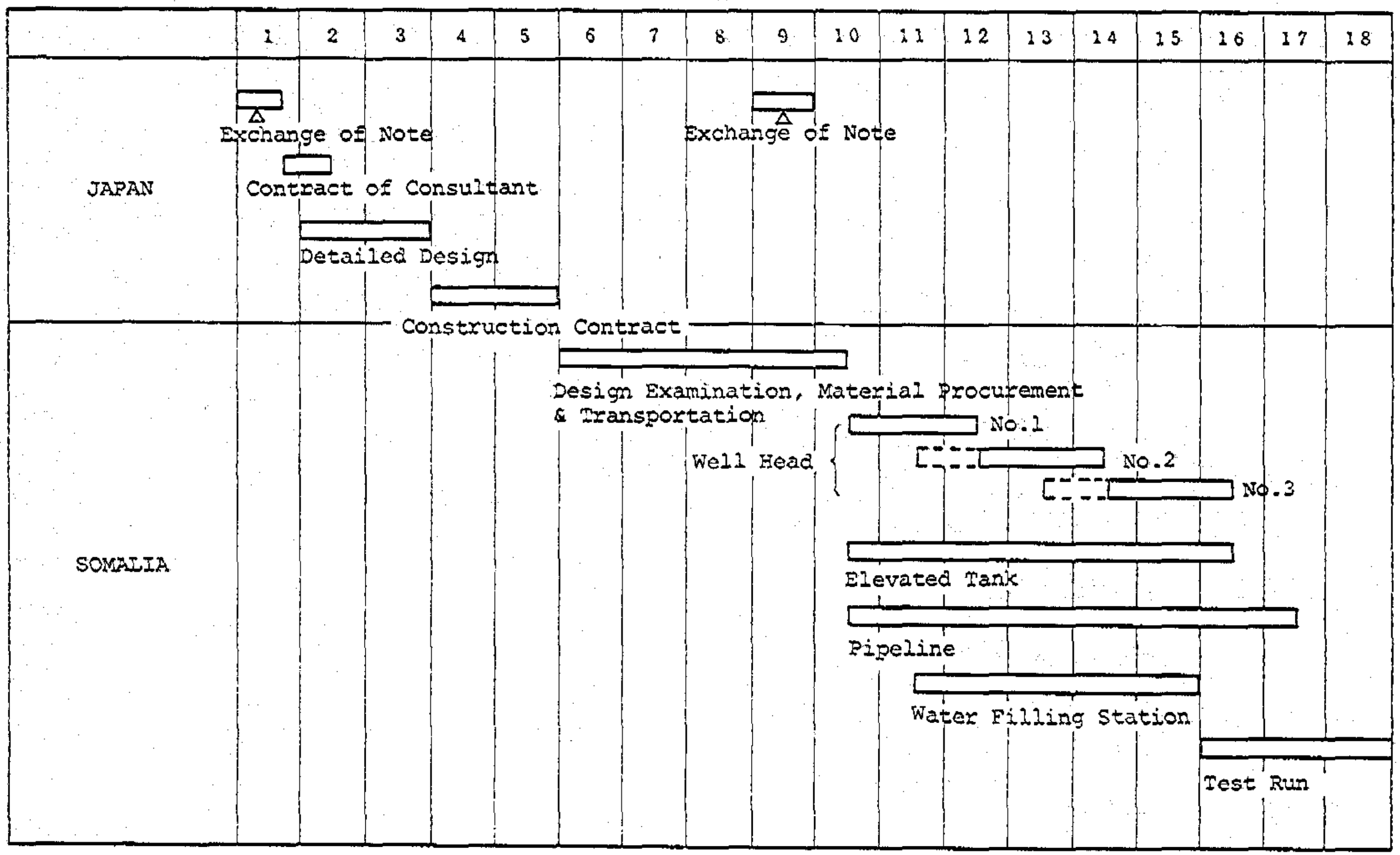
b. Construction supervision at the Project site

The consultant will take charge of the guidance and supervision of the contractor regarding the previous arrangements before starting the work, the transportation of equipment and materials to the construction site, the execution of the work, installation and adjustment, test runs, completion tests, etc., and will carry out the management of the progress, quality management, cost management, etc., in order to finish the job without fail within the time stipulated in the Exchange of Notes.

7-6 Implementation Schedule

The implementation schedule of this project is shown in Fig. 7-2. It takes approximately 4.5 months until the signing of the construction contract, including 2 months for the detailed design after the Exchange of Notes. The construction work at the project site will start approximately 4.5 months after the signing of the construction contract, this time will be spent for procurement and marine transportation of the materials and equipment. The period for the execution of the work at the project site will be approximately 9.5 months, including the preparation period.

Fig. 7-2 Implementation Schedule for Groundwater Development Project in Lower Shabelle



CHAPTER 8

PROJECT APPRAISAL

CHAPTER 8 PROJECT APPRAISAL

8-1 Urgency

Of the 35 refugee camps existing at present, the development of groundwater has been carried out by UNICEF in order to assure a safe and stable water supply to 23 camps located in the Gedo and Hiran Region, and water supply facilities are being installed for 9 camps in the Northwest Region with aid furnished by the People's Republic of China.

In spite of the efforts made by UNICEF to develop groundwater, the 3 camps in the Lower Shabelle Region remain dependent upon the Shabelle River, though the river cannot provide a sufficient amount of water throughout the year. Such undesirable dependence is due to the fact that the salinity of groundwater at this area is too high to be taken as potable water. Under these circumstances, the development of the Lower Shabelle area is restricted to the vicinity of the Shabelle River, though this area has a high developmental potential. Such being the case, the implementation of the Project is urgently needed.

8-2 Socio-economic Aspects

The Project to assure a stable supply of a safe water throughout the year will somewhat relieve the people from too much labor for drawing water, especially during the dry season. The labor thus saved may be shifted to other productive activities such as agriculture, livestock farming, manufacture, commerce, etc. This will steadily activate the development of the Lower Shabelle area which is centered round agriculture and livestock farming, and eventually help establish the infrastructure needed to assist the refugees to settle and increase production of agricultural and livestock products, to improve the living standard and gain foreign currency - the main theme of the National 5-year Development Plan. About 127,700 persons will be benefited by the Project.

8-3 Health and Sanitation

The diseases which are related to water are observed in a high percentage of the inhabitants in the Lower Shabelle area, as the area is relatively densely populated and dependent on the Shabelle River for potable water (Table 3-11).

Since the public health conditions of this area will be improved greatly by the Project, the Project will help substantially reduce water-related digestive diseases and exert a stabilizing effect upon the imhabitants' lives.

8-4 Finance

In addition to the Japanese Grant Aid to be furnished by the Government of Japan, the operation and maintenance of the water supply facilities will require annual expenditures amounting to 20,499,000 So.Sh. Annual expenditure is summation of annual reimbursement to be borne by the Government of Somalia on the basis of a 3% annual interest rate and a 20-year repayment period

$= (\frac{173,486,000}{15.337} = 11,312,000$ So.Sh.) and annual operation and maintenance cost (9,187,000 So.Sh.).

On the other hand, the water charges as of 1990 (target year in which all planned water supply volume is to be consumed) will be as follows:

- Domestic water supply by house connection
  155 m^3/day x 10 Shillings/m^3 x 365 days/year
  = 565,750 Shillings (1,601,072 Yen)
- Public hydrant water supply
  2,068 m^3/day x 10 Shilling/m^3 x 365 days/year
  = 7,548,200 Shillings (21,361,406 Yen)
- Total 8,113,950 Shillings (22,962,478 Yen)

The water charge income accounts for 75% of the running cost.
The price of water excluding the Japanese Grant Aid is 27.8 Shillings (78.6 Yen)/per cubic meter.

$$\text{The price of water} = \frac{\text{Annual expenditures}}{\text{Annual water consumption}}$$

$$= \frac{\frac{173,486,000}{15.337} + 9,187,000}{738,030\ m^3} = 27.8\ \text{So.Sh.}/m^3$$

CHAPTER 9

CONCLUSION AND RECOMMENDATION

CHAPTER 9 CONCLUSION AND RECOMMENDATION

9-1 Conclusion

As for the situation prevailing in the refugee camps and the surrounding areas, the refugee camps and Qoryooley Town are supplied purified water taken from the Shabelle River, but all other villages depend upon the raw water of the Shabelle River for drinking and daily use. It must be borne in mind, however, that no water is available from the Shabelle River in the dry season.

If a stable supply of safe potable water to the refugee camps, Qoryooley Town and other villages located nearby can be secured all the year round through the implementation of the Project using the groundwater of the Beled Amin area as a water resource, it will make it possible not only to upgrade the living environment of this area, but also to actualize the high potentialities of the Lower Shabelle area regarding agriculture and livestock farming. As a result, it will become possible to help in the refugee settlement plan which is centered round the development of the local communities where the refugees can participate in socio-economic activities, while improving agriculture and livestock farming, which is the main theme of the National Five Year Development Plan.

Thus, the Project will serve as a foundation of community development in the refugee camps and the surrounding areas in the long-term perspective. Hence, the Japanese Grant Aid for the Project is judged to be meaningful and reasonable.

9-2 Recommendation

As mentioned above, the Project is expected to make substantial contributions to improving the infrastructure in the refugee camps and the surrounding areas, as well as to creating the environment for the settlement of the refugees. However, in order to achieve favorable operation and maintenance of these water supply facilities and have them fulfill their objectives, necessary systems and organizations must be established by the Government of Somalia, and, especially, steps must be taken to have people recognize how important it is to utilize safe and potable water in the improvement of infrastructure, centering round the improvement of the health and sanitation environment.

The water supply facilities for the Project will be as simple as possible in design and construction and as easy to operate as possible. For more optimum operation and maintenance, however, it is desirable to foster capable technical staff, and secure fuel indispensable for engine/pump operation.

REFERENCE EXTRACTIONS

See attached list of reference collected

ANNEX

ANNEX 1

MINUTES OF DISCUSSION

Minutes of Discussion

on

Ground Water Development Project in Lower Shabelli related to

ICARA II in

Somali Democratic Republic

In response to the request made by the Government of Somali Democratic Republic for Ground Water Development Project in Lower Shabelli related to ICARA II (hereinafter referred to as "the Project), the Government of Japan has sent, through the Japan International Cooperation Agency (hereinafter referred to as "JICA") which is an official agency implementing the technical cooperation of the Government of Japan,a team headed by Mr Seiyu Kamata, Head of Planning Section, Planning & Survey Div., Management Dept., Water Works Bureau, Yokosuka City to conduct the survey for 36 days from May 31st to July 5th, 1985.

The team carried out a field survey, held a series of discussions and exchanged view with the authorities concerned of the Government of Somali Democratic Republic.

Both parties have agreed to recommend to their respective Governments and the authorities concerned to examine the result of the survey attached herewith toward the realisation of the Project.

鎌田晟雄

SEIYU KAMATA

Head, Japanese Basic Design

Survey Team

Mohammed Cumar Asad

Permanent Secretary

Ministry of Mineral & Water

Resources

Attachment

1. The objective of the Project is to provide Ground Water mainly to the Three Qoryoley Refugee Camps and to the Qoryoley Town itself from Belet Amin Area.

2. Both parites confirmed the basic concept of water supply facilities and location plan as shown in Annex I.

3. The Japanese survey team will convey to the Government of Japan the desire of the Government of Somali Democratic Republic that the Former takes necessary measures to cooperate in implementing the Project and bears the cost of the Water Supply system requested by the latter shown in Annex I within the scope of Japanese economic cooperation program in grant form.

4. The Government of Somali Democratic Republic will take necessary measures listed in Annex II under the condition that the grant aid assistance by the Government of Japan is extended to the Project.

5. Both parties confirmed that the Survey team explained Japanese grant aid program and the Somali side has understood it.

Annex I

1. The basic concept of Water Supply facilities and location plan requested by Somali Democratic Republic are shown below. (In addition, Somali side requested Water Supply to the Villages on and around the main distribution line).

2. The projection year for Qoryoley town and other villages will be 1990, however, regarding the Refugees Camps, the population of the present time will be taken for the year 1990.

3. Distribution to private houses or public facilities won't be considered but only public posts will be designed.

Annex II

The following arrangements are requested to be taken by Somali Democratic Republic.

No	Items	To be covered by recipient side	(To be covered) (by Grant Side)
1	To secure land for well(s) and other water supply facilities	•	
2.	To clear, level and reclaim the site when needed	•	
3.	To construct the gate and fence in and around the site when needed	•	
4.	To pave the road with gravels and boulders for access to the site from the main road for both construction and maintenance/ operation	•	
5.	To construct the water supply facilities		(•)
6.	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A.		
	1. Advising commission of A/P	•	
	2. Payment Commission	•	
7.	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1. Marine (Air) transportation of the products from Japan to the recipient country		(•)
	2. Tax exemption and custom clearance of the products at the port of disembarkation	•	
	3. Internal transporation from the port of disembarkation to the project site.		(•)
8.	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the varified contract such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		

S.K

No	Items	To be covered by recipient side	To be covered (by Grant Side)
9	To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.	•	
10.	To bear all the expenses other than those to be borned by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.	•	

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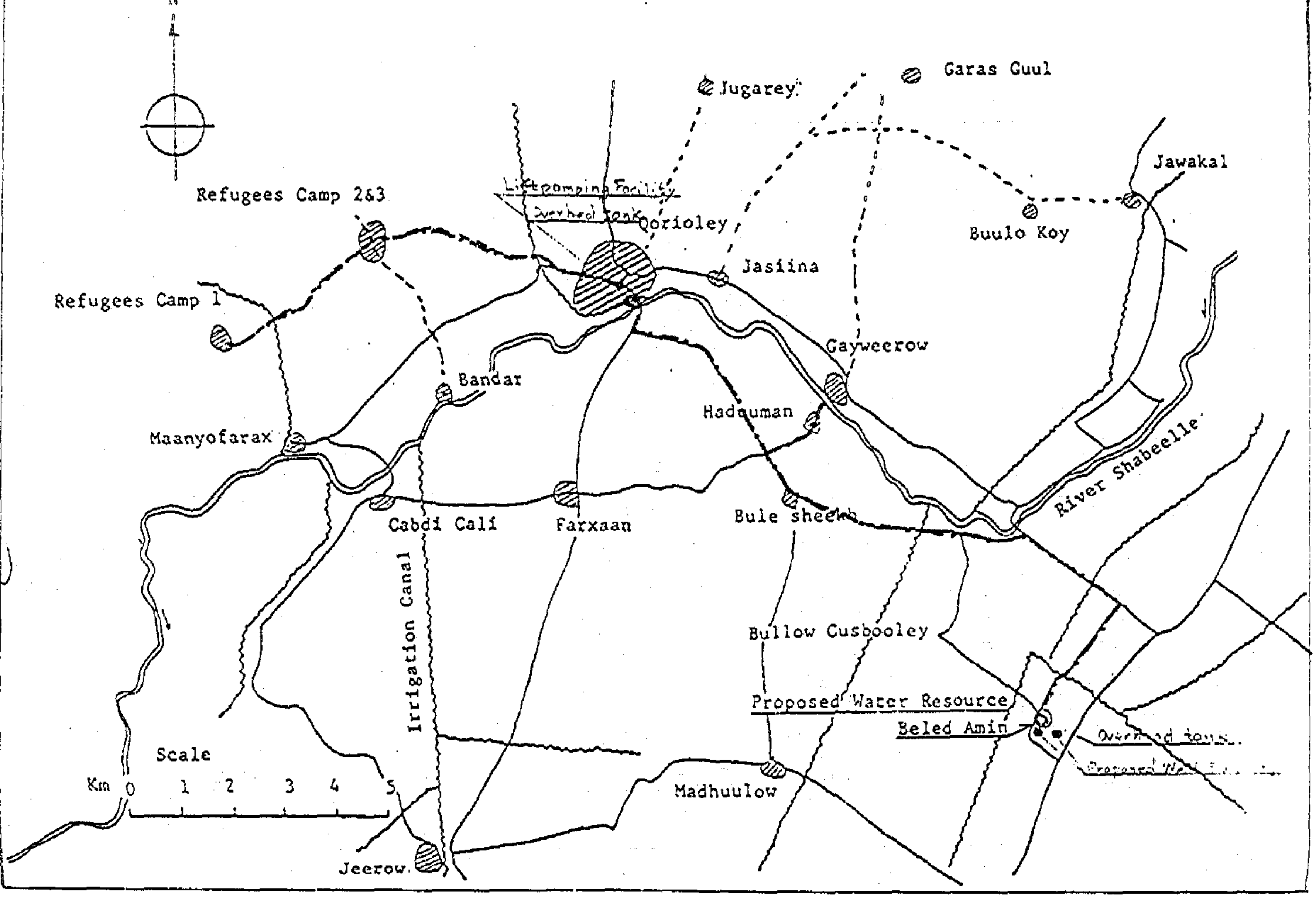
Fig-1. Project Area



ANNEX 2

TEAM MEMBERS

Officials

Mr. Seiyu KAMATA	Team Leader	Planning & Survey Div., Management Dept., Water Works Bureau, Yokosuka City
Mr. Jyunji YOKOKURA	Coordinator	First Basic Design Div., Grant Aid Planning & Survey Dept. Japan International Cooperation Agency

Consultants

Mr. Munetaka MORIO	Survey Manager, Water Works Planner	Japan Engineering Consultants Co., Ltd.
Mr. Kinzo NARITA	Hydro-geological Planner	Japan Engineering Consultants Co., Ltd.
Mr. Ko KUWATA	Surveying Water Supply Planner	Japan Engineering Consultants Co., Ltd.
Mr. Masashi NODA	Facility Designer	Japan Engineering Consultants Co., Ltd.

ANNEX 3

SCHEDULE OF FIELD SURVEY

No.	Day	Date	Study Schedule	Detail of Study Items
1.	31st May	(Fri)	Departure from Narita AZ-787 17:45	
2.	1st June	(Sat)	Arrival at Rome 07:55	
3.	2nd	(Sun)	Departure from Rome AZ-822 23:45	
4.	3rd	(Mon)	Arrive at Mogadishu 09:45	MMWR Meeting on schedule, Team meeting
5.	4th	(Tue)		MMWR, RWSD, NRC Courtesy call, Meeting
6.	5th	(Wed)		MMWR, Undertaking, Question Meeting, Data Collection on well excavating firms
7.	6th	(Thu)		Field survey at Qoryooley - Belet Amin
8.	7th	(Fri)		Field survey at Qoryooley - Refugee camps, Investigation of water supply facility
9.	8th	(Sat)	Mogadishu -- Marca	MMWR data collection WDA (Fellace) data collection NRC data collection
10.	9th	(Sun)		Courtesy call to government of Shallanbood Meeting at MMWR (Counterpart fuel), Survery TP installation
11.	10th	(Mon)		Survey TP installation, Pipe route selection, Marketing survey
12.	11th	(Tue)		Survey CP observation MMWR data collation NRC data cllection MOH data collection
13.	12th	(Wed)		Survey CP observation, County head courtesy call, meeting, Italian agricultural cooperative well survey meeeting

No.	Day	Date	Study Schedule	Detail of Study Items
14.	13th	(Thu)		Meeting with district officials, survey of existing wells. NRC, MOH data collection
15.	14th	(Fri)		Survey of existing wells, Survey of villages, Investigation of water supply affairs, Plain table survey of pipe route
16.	15th	(Sat)		MMWR Q coorination, MWA water supply facility investigation, Plain table survey of pipe route, Water quality data collection, Recent well data collection
17.	16th	(Sun)		MOL wages, Labor conditions data, Central point observation, Water intake test
18.	17th	(Mon)		MMWR Q meeting, MOA weather, Well data collection, Central point observation
19.	18th	(Tue)	Leave Narita BA-006 21:30	Village population, Water survey affairs investigation, Water intake test, Survey of camp population and water supply facility
20.	19th	(Wed)	Leave London SV162 12:30	Village population, Water supply conditions survey, Water intake test, Water supply facility survey of Shallanbood
21.	20th	(Thu)	Arrive at Mogadishu 16:00	Village popoulation, Water supply conditions survey, Water supply facility investigation at Marca, Water intake test
22.	21st	(Fri)		Team meeting; Survey of water source area, Water intake test, Camp population survey
23.	22nd	(Sat)		MMWR, RWSR courtesy call meeting; MOM, RWSD data collection, Water itnake test, Plain table survey

No.	Day	Date	Study Schedule	Detail of Study Items
24.	23rd	(Sun)		Field survey of area included in the Project: Water intake test, Plain table survey, Village population, Water supply investigation
25.	24th	(Mon)		Field survey of area included in the Project: Population survey, Water intake test, Camps 2, 3 plane table survey, Recent well data collection
26.	25th	(Tue)		MMWR draft meeting: Test pit, Investigation of hydrants at Qoryooley, Plain table Survey at Qoryooley
27.	26th	(Wed)		Team meeting: Test of cone pentrometer, Demand survey, Survey of camp population
28.	27th	(Thu)		Proposal of Minutes: Demand survey, Investigation of camp population, Plain table survey at Qoryooley
29.	28th	(Fri)		Team meeting, Demand survey
30.	29th	(Sat)		Meeting on Minutes: Team meeting, Processing
31.	30th	(Sun)		Signing of Minutes: Processing, Preparation for shipment of materials and equipments
			(Mr. Kamata, Mr. Yokokura, Mr. Morio, Mr. Narita)	(Mr. Kuwata, Mr. Noda)
32.	1st	(Mon)	Leave Mogadishu 17:30/SV-163 -- Khartom	Leave Mogadishu 17:30/SV-163 -- Jidda
33.	2nd	(Tue)	Japanese Embassy courtesy call	Leave Jidda 17:30/JL-472 -- Tokyo

No.	Day	Date	Study Schedule	Detail of Study Items
34.	3rd	(Wed)	Leave Khartom 03:10/LH-539 -- London	Arrive at Tokyo 16:00
35.	4th	(Thu)	Leave London 13:10/BA-005 -- Tokyo	
36.	5th	(Fri)	Arrive at Tokyo 14:35	

ANNEX 4

LIST OF INTERVIEWEES

1. Ministry of Mineral and Water Resources (MMWR)

Mr. Ahmed Mohomud Farah	Minister
Mr. Maxmuud Sheekh	Vice Minister
Mr. Mohamud Omar Asad	Secretary
Mr. Mohamed Yussef Yust Awale	Director Hydr. Dep.
Mr. Hassan Roble	Chief of Laboratory Sec.
Mr. Mohamed Hassan	Hydrogeologist
Mr. Mohamad Elmi Dirie	Geologist

2. Water Development Agency (WDA)

Mr. Yusuf Mohammnd Eloi	Deputy Director General
Mr. Constantino Failace	GTZ Adviser
Mr. Abdullahi Abdukahman Ahmed	Director Planning Dept.
Mr. Mohamed Hassan Haji	Hydrogeologist
Mr. Caateeye	Qoryooley Officer
Mr. Olad Ise	Resional Manager of Sharambood
Mr. Nur Warsame Takalo	Marea Water Supply Director

3. Refugee Water Supply Division (RWSD)

Mr. Abdi Haji Mohamed	Director
Mr. Mohamed Abdulcadir Muse	Appropriate Technologist (S.R.W.U.)
Mr. Obsie	Chemist

4. Mr. Khaliif Maxuud Warsame — Qoryooley District Commissioner

5. Mr. Ibrahim Haji Alio — Mayor of Qoryooley Town

6. National Refugee Commission

Mr. Shirdom	Depty Commissioner
Mr. Mohamud Halane Diini	Co-ordinator of Qoryooley Refugee Camp
Mr. Arnold Gijshers	Administrator
Mr. Ali Somane Haji	Officer of Qoryooley Refugee Camp I

7. United Nations High Commissioner for Refugees (UNHCR)

Mr. Ainold Gijshert	Adviser of RWSD

8. Mogadishu Water Agency (MWA)

Mr. Ahmed Mohamud Handulle	Technical Director

9.	Ministry of Health	
	Mr. Pospisilik	Sanitary Engineer of WHO
10.	Ministry of Agriculature	
	Mr. Doff Maurizio Lupi	Canadian Adviser
	Mr. Mohamoud M. Ali	Director of Land and Water
11.	Primary Health Care (PHC)	
	Dr. Abdirazzak Farah	Team Leader
	Dr. Abdlaahi Mohamed	District Medical Office
12.	Ministry of Labour	
	Mr. Hassan Elmi Kuulle	Director of Shallanbood
	Mr. Hasan Dero	
13.	Mr. Nur Ali Ahmed	Regional Secretary of Party (Shallanbood)
14.	Somali Fruit Company	
	Mr. Mohamed Abukar Hagi	
15.	Central Bank	
	Mr. Aamir Said	Dept. of Foreign Exchange
16.	Commercial & Savings Bank	
	Mr. Saeed Garseef	International Div.
	Mr. Abdullahi Seek Mohamed	Vice Manager
	Farxaan Village	
	Mr. Adnan Malin Yusuf	Chief

ANNEX 5

GENERAL DESCRIPTION OF SOCIAL AND ECONOMICAL CIRCUMSTANCE

(1) Somali Democratic Republic is situated in the Northeast sector of the Continent of Africa, so-called "the Horn of Africa", ranging from 12°0'N. to 1°35'S. in lat. and from 41°0' to 51°25'E. in long., facing the Bay of Aden as well as the Indian Ocean, bordering on Djibouti to the north, Ethiopia to the east and Kenya to the south, with a land area of 637,644km².

The population is approx. 5.1 mil. (as by 1983, presumed), and the rate of national increase is 3.1%/year (1972-1981).

(2) Domestic Administration

Since the revolution in October 1969, led by Major General Siad Balle, the country has been under the administration of the military junta under the leadership of President Balle. The Constitution enacted in September 1979, permits the Somali Revolutional Socialistic Party (SRSP) to be the only legal political party.

President Balle was designated by the People's Congress in January 1980, to be President again for another six years, which is the current situation.

(3) Foreign Policy

Since the revolution in 1969, the country has had close ties with the Soviet Union, but Soviet military aid to Ethiopia at the time of the Somalia dispute with this adjoining country in August, 1977, caused Somalia to abrogate the Friendship and Co-Operation Treaty with the Soviets in November 1977. Since then, Somalia has strengthened fiendly tie with Western nations.

Over 95% of Somali nationals are Mohammedans of the Sunni Sect, but the country became a member of the Arabic Union in 1974 and holds good relation even with such moderate Arab nations as Egypt and Saudi-Arabia.

(4) Economy

Major industries of Somalia are stock-farming and agriculture and the GNP per capita is $250 (1983). Export of livestock products and bananas constitute as high as 95% of the total export of this under developed country. This causes unstableness in foreign currency income making the country's trade balance fluctuate and a chronic deficit finance situation obliges the country to depend greatly upon foreign aid and loans.

Further, about 700 thousand refugees flowing in from Ethiopia causes unfavorable pressure on the Somali economy.

(5) Somali Relationship with Japan

The Japanese Government granted recognition to Somali when it gained independence on July 1, 1960. The Japanese Embassy in Sudan takes care of diplomatic affairs with Somalia, while Somalia opened an embassy in Japan on October 1, 1982. The economic and technological co-operative relationship between the two countries has developed at a steady pale. The Japanese soft loan for the Tele-Communication Enlargement Project amounted to 5,270 mil. yen (contract entered into on Dec., 1983), while the free fund co-operation, which began with fishery and food aids in 1981, has totaled 4,776 mil. yen by the end of Mar., 1985.

In 1983, imports from Japan was $11,629,000, while Somali exports to Japan was $79,000, which resulted in a large trade deficit for Somalia.

REFERENCE

1) GNP per capita (IBRD Development Report 1978 - 1985)

1976	1977	1978	1979	1980	1981	1982	1983
$110	$110	$130	N.A.	N.A.	$280	$290	$250

2) Gross national product (IBRD Development Report 1978 - 1985) in mil. dollars

1979	1980	1981	1982	1983
1,030	1,130	1,230	N.A.	1,540

3) Balance of international accounts (IBRD Development Report 1981 - 1985) in mil. dollars

	1977	1978	1979	1980	1981	1982	1983
Export	100	107	111	141	200	317	163
Import	160	241	287	240	199	378	422
Trade balance	60	134	176	99	1	61	259
Ordinary balance	31	63	205	136	30	177	150

4) Foreign currency preparation (IBRD Development Report 1978 - 1985) in mil. dollars

1976	1977	1978	1979	1980	1981	1982	1983
85	121	131	54	27	38	15	207

5) Governmental debt to overseas (IBRD Development Report 1978 - 1985) in mil. dollars

1976	1977	1978	1979	1980	1981	1982	1983
277	401	496	546	688	877	944	1,149

6) Rate of consumer price hike (1985 Somalia Ministry of Planning)

1978	1979	1980	1981	1982	1983	1984
10.2%	23.7%	59.2%	44.4%	22.6%	36.4%	92.2%

7) Trade balance between Somalia and Japan (as per custom statistics), in thous. dollars

	1979	1980	1981	1982	1983
Import from Japan	2,767	5,126	5,580	3,174	11,629
Export to Japan	895	-	91	-	79
Balance	1,872	5,126	5,489	3,174	11,550