

Table G-5.7 (1/5) Water Demand Forecast at Each Area

Name of Area	1995 (Percentage of Population Served: 74 %)												Water Requirement m <sup>3</sup> /d		
	Served Population	Area (ha)	Density	Classified Consumption (m <sup>3</sup> /d)								Public		Total	
				Domestic	University	Governmental	Commercial	Industrial	Manufacturing	Water Right					
<b>Villages*</b>															
Tigch	3,975	44	90	323		68	20			3		27	440	1,333	
Al Khadra	2,231	12	191	181		38	11			2		15	247	748	
Bassime	458	18	27	38		8	2			0		3	52	157	
Ashrafye Wadi	3,311	27	123	269		57	17			2		22	366	1,110	
Judayde	4,454	53	84	362		76	22			3		30	494	1,497	
Hame	21,570	56	384	1,754		369	108	16		15		145	2,403	7,283	
Jumayya	2,034	5	384	165		35	10			1		14	225	682	
Kudsaya	43,398	158	275	3,522		743	217	33		29		292	4,836	14,653	
Takadom	36,750	55	674	2,583		629	184			25		247	4,067	12,325	
Military Area 4 (Residential)	14,040	85	165	1,140		249	70			9		94	1,554	4,709	
Maaraba				0		0	0			0		0	0	0	
<b>Sub-total</b>	<b>132,241</b>	<b>513</b>	<b>258</b>	<b>10,733</b>	<b>0</b>	<b>2,263</b>	<b>661</b>	<b>49</b>	<b>89</b>	<b>0</b>	<b>890</b>	<b>14,684</b>	<b>44,498</b>		
<b>Proposed New Development Area</b>															
Kudsaya New Suburb				0		0	0			0		0	0	0	
Proposed Kudsaya New Suburb				0		0	0			0		0	0	0	
Dummar Extension Area (1st phase)				0		0	0			0		0	0	0	
Dummar Extension Area (2nd phase)				0		0	0			0		0	0	0	
Kassioun New Town (650 ha)				0		0	0			0		0	0	0	
Assad Suburb (1st phase)				0		0	0			0		0	0	0	
Assad Suburb (2nd phase)				0		0	0			0		0	0	0	
Assad Suburb Extension Area				0		0	0			0		0	0	0	
Kaboon Green Area				0		0	0			0		0	0	0	
Assad City				0		0	0			0		0	0	0	
Proposed Assad City Extension Area (1)				0		0	0			0		0	0	0	
Proposed Assad City Extension Area (2)				0		0	0			0		0	0	0	
Proposed Assad City Extension Area (3)				0		0	0			0		0	0	0	
Special Area Zone (State Factory) **	3,500	25	140	100									100	303	
Others (not classified)				0									0	0	
<b>Sub-total</b>	<b>3,500</b>	<b>25</b>	<b>140</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>303</b>	
<b>Existing Damascus City</b>															
Reku Aldyn	166,768	437	382	13,536		2,885	833			112		4,774	1,122	23,261	70,416
Mouhagreen	77,461	363	213	6,287		1,357	387			52		2,217	521	10,821	32,718
Mezze	110,002	1,328	83	8,923	4,456	1,913	550			74		3,149	740	19,810	59,957
Cafarouse	96,031	1,200	80	7,794		1,674	480	72		65		2,739	646	13,479	40,772
Kanawat	66,761	269	248	5,415	2,704	1,173	334			45		1,911	449	12,035	36,306
Kadarn	64,175	390	214	5,209		1,129	321	48		43		1,842	432	9,019	27,256
Midan	143,579	296	485	11,654		2,488	717	108		97		4,110	966	20,139	60,955
Old City	18,493	145	128	1,534		318	125			12		529	168	2,717	8,160
Shaghour	65,631	470	140	5,327		1,154	328	49		44		1,879	441	9,223	27,874
Sarouja	117,617	349	337	9,516		2,044	588			79		3,367	791	16,415	49,669
Yarmouk	214,689	227	948	17,425		3,705	1,073			97		6,135	1,444	29,879	90,468
Jobar	104,106	642	162	8,450		1,812	520	78		70		2,980	700	14,611	44,203
Berze	75,899	673	113	6,160	3,074	1,330	379	57		51		2,173	511	13,735	41,548
Kaboon	51,592	497	104	4,187		914	258	39		35		1,477	347	7,257	21,916
Dummar	49,415	473	104	4,011		877	247			33		1,414	332	6,914	20,880
Kassioun Mountain				2,956										0	0
<b>Sub-total</b>	<b>1,422,209</b>	<b>10,624</b>	<b>134</b>	<b>115,467</b>	<b>10,235</b>	<b>24,802</b>	<b>7,139</b>	<b>452</b>	<b>910</b>	<b>40,780</b>	<b>9,610</b>	<b>209,315</b>	<b>633,188</b>		
<b>Total</b>	<b>1,557,950</b>	<b>11,162</b>	<b>149</b>	<b>126,300</b>	<b>10,235</b>	<b>27,065</b>	<b>7,800</b>	<b>501</b>	<b>999</b>	<b>40,780</b>	<b>10,500</b>	<b>224,100</b>	<b>678,000</b>		

(Source: Damascus Governorate & DAWSSA)

(Remarks)

\* : Area of Villages is water served area.

\*\* : It is a bulk water system to supply water from DAWSSA.

Table G-5.7 (2/5) Water Demand Forecast at Each Area

Name of Area	2000 (Percentage of Population Served : 90 %)											Water Requirement (m <sup>3</sup> /d)	
	Population	Area (ha)	Density	Domestic	University	Governmental	Commercial	Industrial	Manufacturing	Water Right	Public		Total
<b>Villages*</b>													
Fiqh	4,359	44	99	688		199	61		4		27	977	1,700
Al Khadra	2,463	12	211	386		112	34		2		15	548	900
Bassime	517	18	30	81		23	7		0		3	115	200
Ashrafye Wadi	3,656	27	136	573		166	50		3		22	814	1,400
Judayde	4,928	53	93	772		223	68		4		30	1,097	1,900
Hame	23,815	56	424	3,731		1,070	328	159	19		146	5,462	9,100
Jemarya	2,246	5	424	352		102	31		2		14	500	900
Kudsaya	46,131	158	293	7,228		2,089	636	165	37		282	10,437	17,300
Takadom	40,575	55	744	6,357		1,837	559		32		248	9,034	15,000
Military Area 4 (Residential)	14,040	85	165	2,200		636	194		11		86	3,126	5,300
Maaraba				0		0	0		0		0	0	0
Sub-total	142,763	512	279	22,368	0	6,464	1,968	324	114	0	873	32,111	53,700
<b>Proposed New Development Area</b>													
Kudsaya New Suburb				0		0	0		0		0	0	0
Proposed Kudsaya New Suburb				0		0	0		0		0	0	0
Dummar Extension Area (1st phase)	20,500	124	165	3,212		928	283		16		125	4,564	7,600
Dummar Extension Area (2nd phase)				0		0	0		0		0	0	0
Kassioun New Town (650 ha)				0		0	0		0		0	0	0
Assad Suburb (1st phase)				0		0	0		0		0	0	0
Assad Suburb (2nd phase)				0		0	0		0		0	0	0
Assad Suburb Extension Area				0		0	0		0		0	0	0
Kaboon Green Area				0		0	0		0		0	0	0
Assad City				0		0	0		0		0	0	0
Proposed Assad City Extension Area (1)				0		0	0		0		0	0	0
Proposed Assad City Extension Area (2)				0		0	0		0		0	0	0
Proposed Assad City Extension Area (3)				0		0	0		0		0	0	0
Special Area Zone (State Factory) **	3,500	25	140	500								500	900
Others (not classified)				0								0	0
Sub-total	24,000	149	161	3,712	0	928	283	0	16	0	125	5,064	8,500
<b>Existing Damascus City</b>													
Ruku Aldyn	184,125	437	421	28,848		8,317	2,539		147	4,980	1,126	45,976	75,600
Mouhajeen	85,523	363	235	13,400		3,872	1,179		68	2,313	523	21,355	35,200
Mezze	121,451	1,328	91	19,029	8,870	5,459	1,674		97	3,285	743	39,196	64,500
Cafarsouse	106,015	1,300	88	16,510		4,800	1,462	710	85	2,867	648	27,182	44,800
Kanawut	73,710	269	274	11,549	6,246	3,317	1,016		59	1,993	451	24,651	40,700
Kudam	70,855	300	236	11,101		3,208	977	474	57	1,916	433	18,167	30,000
Midan	158,523	296	536	24,837		7,178	2,186	1,061	127	4,287	969	40,644	66,900
Old City	20,417	145	141	3,199		924	281		16	552	125	5,098	8,600
Shahboor	72,462	470	154	11,353		3,281	999	485	58	1,950	443	18,379	30,700
Sarouja	129,859	349	373	20,346		5,880	1,790		104	3,512	794	32,426	53,400
Yarmouk	237,034	227	1,047	37,138		10,732	3,268		189	6,410	1,449	59,188	97,300
Jobar	114,942	642	179	18,009		5,204	1,585	769	92	3,109	703	29,470	48,600
Berre	83,799	673	125	13,129	6,120	3,294	1,155	561	67	2,266	512	27,605	45,500
Kaboon	56,961	497	115	8,925		2,579	785	381	46	1,510	348	14,604	24,200
Dummar	54,558	473	115	8,548		2,470	757		44	1,475	334	13,623	22,600
Kassioun Mountain		2,956										0	0
Sub-total	1,570,234	10,624	148	246,020	21,235	71,097	21,649	4,441	1,255	42,466	9,602	417,265	688,600
<b>Total</b>	<b>1,735,997</b>	<b>11,286</b>	<b>154</b>	<b>272,100</b>	<b>21,235</b>	<b>78,489</b>	<b>23,900</b>	<b>4,765</b>	<b>1,385</b>	<b>42,466</b>	<b>10,600</b>	<b>455,000</b>	<b>750,800</b>

(Source : Damascus Governorate & DAWSSA)

(Remarks)

\* : Area of Villages is water served area.

\*\* : It is a bulk water system to supply water from DAWSSA.

Table G-5.7 (3/5) Water Demand Forecast at Each Area

Name of Area	2005											Water Requirement m <sup>3</sup> /d		
	Population	Area (ha)	Density	Classified Consumption (m <sup>3</sup> /d)									Total	
				Domestic	University	Governmental	Commercial	Industrial	Manufacturing	Water Right	Public			
<b>Villages*</b>														
Fiqh	4,845	44	109	938		201	61			4		27	1,230	1,700
Al Khadra	2,319	12	232	526		113	34			2		15	691	1,000
Bassime	570	18	33	110		24	7			0		3	145	200
Ashrafye Wadi	4,037	27	150	781		167	51			3		23	1,025	1,400
Jdayde	5,441	53	102	1,053		225	69			4		30	1,382	2,000
Hame	26,294	56	468	5,089		1,090	333	164		19		147	6,842	9,900
Jemarya	2,479	5	468	480		103	31			2		14	630	900
Kudsaya	49,109	158	311	9,505		2,035	621	157		36		275	12,630	18,300
Takadom	44,798	55	822	8,670		1,856	567			33		251	11,377	16,400
Military Area 4 (Residential)	14,040	85	165	2,717		582	178			10		79	3,566	5,100
Maaraba				0		0	0			0		0	0	0
Sub-total	154,332	512	301	29,870	0	6,396	1,952	321		113	0	865	39,517	56,900
<b>Proposed New Development Area</b>														
Kudsaya New Suburb	30,000	300	100	5,806		1,243	379			22		168	7,619	11,000
Proposed Kudsaya New Suburb				0		0	0			0		0	0	0
Dummar Extension Area (1st phase)	26,293	124	216	5,186		1,110	339			20		150	6,805	9,800
Dummar Extension Area (2nd phase)				0		0	0			0		0	0	0
Kassioum New Town (650 ha)				0		0	0			0		0	0	0
Assad Suburb (1st phase)				0		0	0			0		0	0	0
Assad Suburb (2nd phase)				0		0	0			0		0	0	0
Assad Suburb Extension Area				0		0	0			0		0	0	0
Kaboon Green Area				0		0	0			0		0	0	0
Assad City				0		0	0			0		0	0	0
Proposed Assad City Extension Area (1)				0		0	0			0		0	0	0
Proposed Assad City Extension Area (2)				0		0	0			0		0	0	0
Proposed Assad City Extension Area (3)				0		0	0			0		0	0	0
Special Area Zone (State Factory) **	4,000	25	160	500									500	700
Others (not classified)				0									0	0
Sub-total	60,293	449	135	11,492	0	2,354	718	0		42	0	318	14,924	21,500
<b>Existing Damascus City</b>														
Ruku Aldyb	203,289	437	465	29,345		8,424	2,571			149		4,980	56,609	82,042
Mouhajerco	94,424	363	260	18,275		3,913	1,194			69		2,313	26,294	38,107
Mezze	134,092	1,328	101	25,953	9,108	5,557	1,696			58		3,285	752	46,447
Kafar Soutch	117,649	1,200	98	22,654		4,851	1,481	730		56		2,867	656	33,324
Kanawat	81,381	269	302	15,751	6,413	3,373	1,029			60		1,923	456	29,075
Kadam	78,229	300	261	15,141		3,242	990	488		57		1,916	438	22,272
Midan	175,022	296	591	33,874		7,253	2,214	1,092		128		4,287	981	49,829
Old City	22,542	145	155	4,363		934	285			16		552	126	6,277
Shaghour	89,094	470	170	15,454		3,315	1,012	499		59		1,960	448	22,727
Sarouja	143,375	349	411	27,749		5,942	1,814			105		3,512	804	39,925
Yannouk	261,704	227	1,155	50,651		10,845	3,310			191		6,410	1,467	72,875
Jobar	126,905	642	198	24,562		5,259	1,605	792		93		3,109	711	36,130
Bezze	92,521	673	137	17,907	6,284	3,834	1,170	577		68		2,266	519	32,625
Kaboon	62,890	497	127	12,172		2,606	796	392		46		1,540	352	17,905
Dummar	60,237	473	127	11,658		2,496	762			44		1,476	338	16,274
Kassioum Mountain				2,956										0
Sub-total	1,733,664	10,624	463	335,538	21,805	71,845	21,929	4,521		1,269		42,466	9,717	509,180
<b>Total</b>	<b>1,949,789</b>	<b>11,585</b>	<b>168</b>	<b>376,900</b>	<b>21,805</b>	<b>80,594</b>	<b>24,600</b>	<b>4,893</b>		<b>1,423</b>		<b>42,466</b>	<b>10,900</b>	<b>563,600</b>

(Source : Damascus Governorate & DAWSSA)

(Remarks)

\* : Area of Villages is water served area

\*\* : It is a bulk water system to supply water from DAWSSA.

Table G-5.7 (4/5) Water Demand Forecast at Each Area

Name of Area	2010											Water Requirement m <sup>3</sup> /d		
	Served Population	Area (ha)	Density	Classified Consumption (m <sup>3</sup> /d)									Total	
				Domestic	University	Governmental	Commercial	Industrial	Manufacturing	Water Right	Public			
Villages*														
Figeb	4,968	44	112	1,013		198	35		3		27	1,276	1,272	
Al Khadra	2,788	12	238	569		111	20		2		15	716	994	
Bassime	585	18	33	119		23	4		0		3	150	209	
Ashrafye Wadi	4,138	27	154	844		165	29		3		22	1,063	1,476	
Judayde	5,579	53	105	1,138		222	39		4		30	1,433	1,990	
Hame	26,958	56	480	5,497		1,072	190	175	19		144	2,098	9,859	
Jomaya	2,542	5	480	518		102	31		2		14	667	926	
Kudsaya	55,951	158	354	11,410		2,089	636	309	37		282	14,763	20,505	
Takadom	49,461	55	908	10,086		1,837	559		32		248	12,764	17,227	
Military Area 4 (Residential)	14,040	65	165	2,863		558	99		10		75	3,606	5,008	
Manaba				0		0	0		0		0	0	0	
Sub-total	167,010	512	326	34,058	0	6,377	1,644	485	113	0	860	43,535	60,466	
Proposed New Development Area												0	0	
Kudsaya New Suburb	48,315	300	161	9,853		1,921	341		34		259	12,408	17,234	
Proposed Kudsaya New Suburb				0		0	0		0		0	0	0	
Dummar Extension Area (1st phase)	35,047	124	282	7,141		1,393	247		25		188	8,993	12,490	
Dummar Extension Area (2nd phase)				0		0	0		0		0	0	0	
Kassioum New Town (650 ha)				0		0	0		0		0	0	0	
Assad Suburb (1st phase)	11,849	40	296	2,416		471	84		8		63	3,043	4,226	
Assad Suburb (2nd phase)	25,000	193	130	5,098		994	177		18		134	6,420	8,917	
Assad Suburb Extension Area				0		0	0		0		0	0	0	
Kaboon Green Area		530	0	0		0	0		0		0	0	0	
Assad City				0		0	0		0		0	0	0	
Proposed Assad City Extension Area (1)				0		0	0		0		0	0	0	
Proposed Assad City Extension Area (2)				0		0	0		0		0	0	0	
Proposed Assad City Extension Area (3)				0		0	0		0		0	0	0	
Special Area Zone (State Factory) **	4,204	25	168	500								500	694	
Others (not classified)				0								0	0	
Sub-total	124,385	1,212	103	25,008	0	4,783	849	0	84	0	644	31,365	43,562	
Existing Damascus City												0	0	
Ruku Albya	224,848	437	513	45,771		8,926	2,265		158		4,980	1,202	63,301	88,165
Mouhajreen	104,252	363	287	21,260		4,146	1,416		73		2,313	558	29,766	41,588
Mezze	148,048	1,328	111	30,191	9,712	5,888	1,725		104		3,285	793	51,697	72,048
Kafar Sousseh	129,231	1,200	108	26,353		5,140	1,592	756	91		2,867	692	37,491	52,318
Kanawat	89,852	269	334	18,323	6,839	3,573	1,314		63		1,993	481	32,587	45,507
Kadom	86,372	300	288	17,613		3,435	1,289	505	61		1,916	463	25,282	35,361
Midan	193,239	296	653	39,406		7,685	2,044	1,120	136		4,287	1,035	55,124	77,641
Old City	24,889	145	172	5,075		990	855		17		555	133	7,623	10,835
Shaghour	88,331	470	188	18,013		3,513	1,303	517	62		1,960	473	25,840	36,136
Sarouja	158,297	349	454	32,281		6,295	1,797		111		3,512	845	41,844	62,531
Yarmouk	288,943	227	1,276	58,923		10,158	2,720		179		6,410	1,392	79,783	111,057
Jobar	140,113	642	218	28,573		5,572	1,669	820	98		3,109	750	40,591	56,623
Berze	102,150	673	152	20,831	6,701	4,663	1,401	598	72		2,266	547	36,478	50,911
Kaboon	69,436	497	140	14,160		2,761	1,170	406	49		1,540	372	20,458	28,661
Dummar	66,506	473	141	13,562		2,645	1,149		47		1,415	356	19,234	26,961
Kassioum Mountain		2,956										0	0	
Sub-total	1,914,107	10,624	180	390,335	23,252	74,791	23,708	4,232	1,320	42,466	10,096	570,099	796,343	
Total	2,205,502	12,349	179	419,400	23,252	85,948	26,200	5,217	1,517	42,466	11,600	645,600	900,400	

(Source : Damascus Governorate & DAWSSA)

(Remarks)

\* : Area of Villages is water served area.

\*\* : It is a bulk water system to supply water from DAWSSA.

Table G-5.7 (S/5) Water Demand Forecast at Each Area

Name of Area	2015												Water Requirement m <sup>3</sup> /d		
	Served Population	Area (ha)	Density	Classified Consumption (m <sup>3</sup> /d)											
				Domestic	University	Governmental	Commercial	Industrial	Manufacturing	Water Right	Public	Total			
<b>Villages*</b>															
Hijeh	5,093	44	115	1,076		192	59			3		26	1,356	1,808	
Al Khadra	2,858	12	241	597		108	33			2		15	754	1,005	
Basime	600	18	34	113		23	7			0		3	146	195	
Ashrafye Wadi	4,243	27	158	894		160	49			3		22	1,127	1,503	
Jedayde	5,719	53	108	1,210		216	66			4		29	1,525	2,033	
Hame	27,638	56	492	5,909		1,042	318	165		18		141	7,593	10,123	
Kmarya	2,606	5	492	543		98	36			2		13	686	915	
Kudsaya	63,412	158	401	13,578		2,391	229	256		42		323	17,318	23,091	
Takadom	54,609	55	1,002	11,691		2,059	628			36		278	14,602	19,589	
Military Area 4 (Residential)	14,040	85	165	2,994		529	161			9		71	3,766	5,024	
Maaraba				0		0	0			0		0	0	0	
Sub-total	180,818	512	353	38,605	0	6,818	2,079	431		120		920	48,962	65,283	
<b>Proposed New Development Area</b>															
Kudsaya New Suburb	53,344	300	178	11,419		2,011	613			36		271	14,351	19,135	
Proposed Kudsaya New Suburb				0		0	0			0		0	0	0	
Dummar Extension Area (1st phase)	38,662	124	312	8,272		1,458	414			26		197	10,397	13,662	
Dummar Extension Area (2nd phase)	25,000	216	116	5,341		943	287			17		127	6,717	8,956	
Kassouh New Town (650 ha)				0		0	0			0		0	0	0	
Assad Suburb (1st phase)	13,082	40	327	2,782		493	150			9		67	3,508	4,677	
Assad Suburb (2nd phase)	33,456	193	174	2,156		1,262	365			22		170	8,995	11,993	
Assad Suburb Extension Area	14,000	298	47	2,985		528	161			9		71	3,755	5,066	
Kaboon Green Area				0		0	0			0		0	0	0	
Assad City	25,000	655	38	5,344		943	287			17		127	6,717	8,956	
Proposed Assad City Extension Area (1)				0		0	0			0		0	0	0	
Proposed Assad City Extension Area (2)				0		0	0			0		0	0	0	
Proposed Assad City Extension Area (3)				0		0	0			0		0	0	0	
Special Area Zone (State Factory) **	4,418	25	177	500									500	667	
Others (not classified)				0									0	0	
Sub-total	206,962	2,380	87	43,806	0	7,637	2,328	0		135		1,020	54,940	73,253	
<b>Existing Damascus City</b>															
Reku Ablyn	247,808	437	567	53,106		9,344	2,849			165		4,980	1,261	71,703	95,604
Mshajreen	115,103	363	317	24,658		4,340	1,323			77		2,313	585	33,297	44,396
Mezze	163,457	1,328	123	35,024	10,638	6,163	1,879			109		3,285	831	57,929	77,239
Kafar Souseh	142,682	1,200	119	30,570		5,380	1,640	850		95		2,567	726	42,129	56,172
Kanawat	99,203	260	368	21,250	7,492	3,741	1,140			66		1,993	505	36,187	48,249
Kadam	95,361	300	318	20,426		3,596	1,095	568		63		1,916	485	28,151	37,535
Midan	213,351	296	721	45,719		8,045	2,453	1,271		142		4,287	1,085	63,002	84,003
Old City	27,479	145	190	5,875		1,036	316			18		552	140	7,937	10,583
Shayhour	97,524	470	207	20,890		3,677	1,121	581		65		1,960	496	28,790	38,387
Sarouja	174,773	349	502	37,449		6,590	2,009			116		3,512	889	50,566	67,421
Yarmouk	319,016	227	1,408	68,370		12,017	3,667			212		6,410	1,623	92,300	123,066
Johar	154,626	642	241	33,146		5,833	1,778	922		103		3,109	787	45,677	60,903
Beize	112,782	673	168	24,164	7,340	4,253	1,296	645		75		2,266	574	40,610	54,147
Kaboon	76,662	497	154	16,418		2,891	881	457		51		1,540	390	22,628	30,171
Dummar	73,428	473	155	15,725		2,769	844			49		1,475	374	21,235	28,314
Kassouh Mountain				2,956										0	
Sub-total	2,113,325	10,624	199	452,787	25,470	79,675	24,292	5,295		1,497		42,466	10,750	642,442	856,190
<b>Total</b>	<b>2,501,103</b>	<b>13,517</b>	<b>185</b>	<b>535,501</b>	<b>25,470</b>	<b>94,130</b>	<b>28,700</b>	<b>5,715</b>		<b>1,662</b>		<b>42,466</b>	<b>12,700</b>	<b>746,100</b>	<b>994,800</b>

(Source : Damascus Governorate & DAWSSA)

(Remarks)

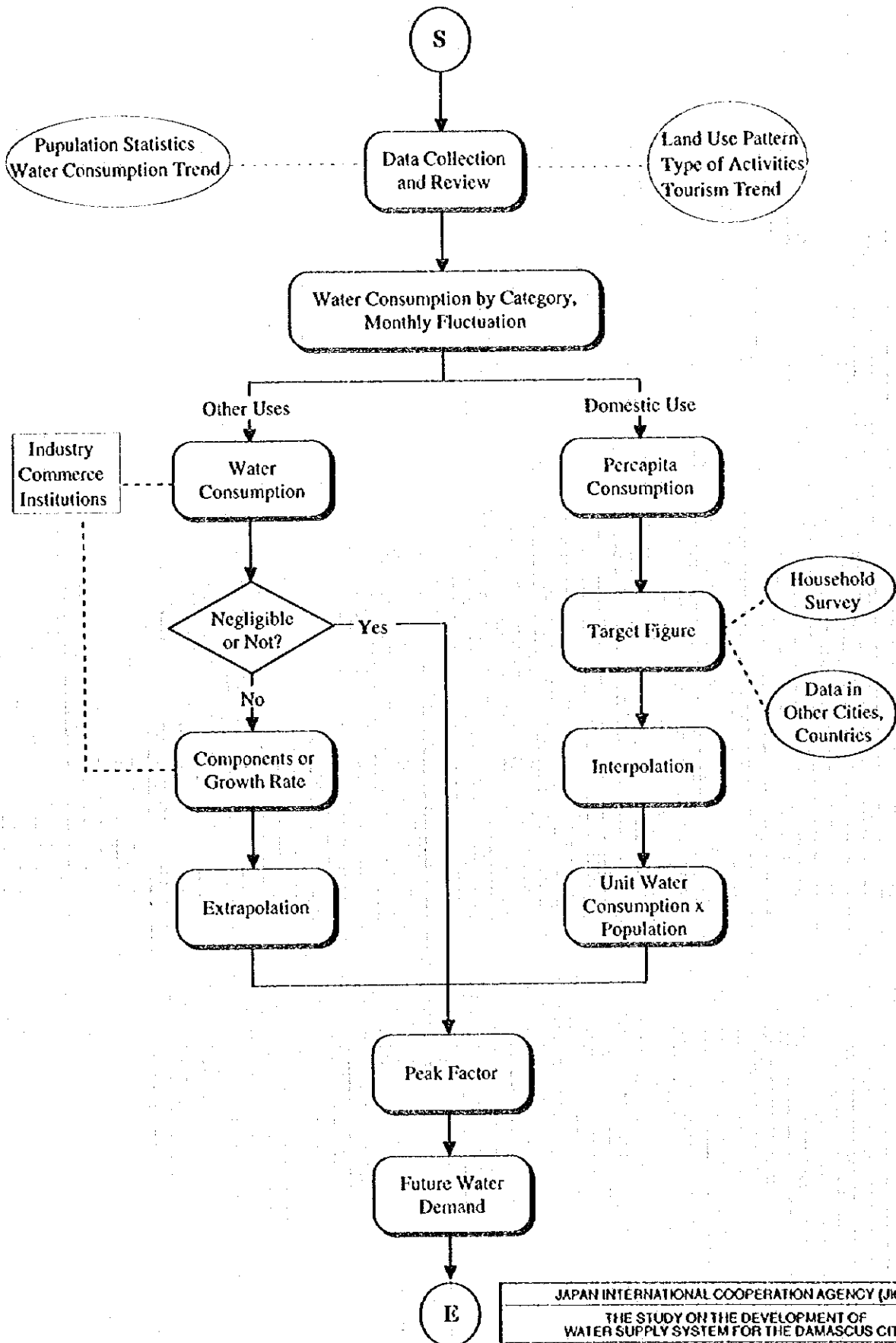
\* : Area of Villages is water served area.

\*\* : It is a bulk water system to supply water from DAWSSA.

**FIGURES**



Figure G-1.1 Water Demand Forecast



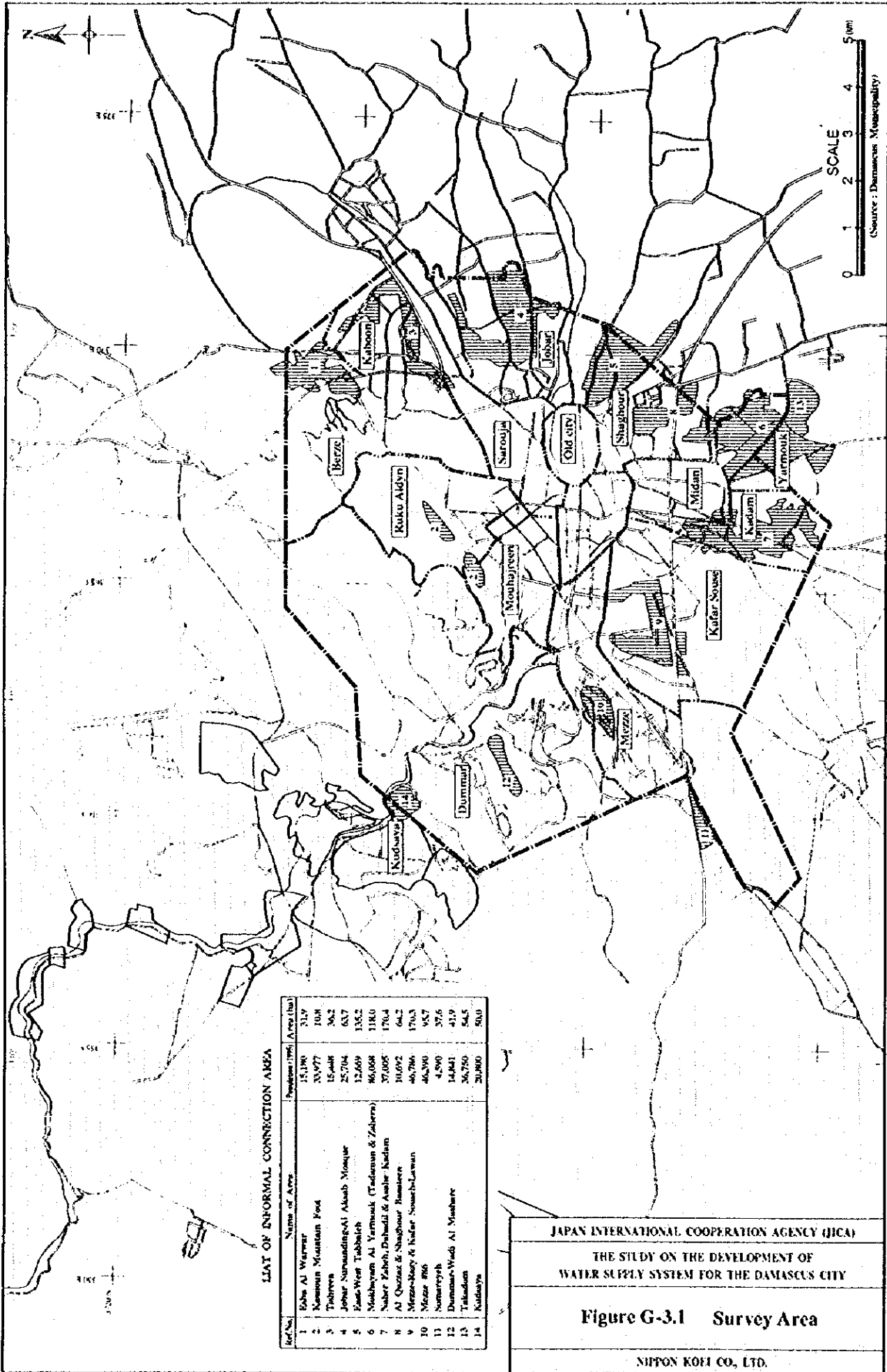
Source: JICA Study Team

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WATER SUPPLY SYSTEM FOR THE DAMASCUS CITY

Figure G-1.1 Water Demand Forecast

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LIST OF INFORMAL CONNECTION AREA

Ref. No.	Name of Area	Population (1965)	Area (ha)
1	Echa Al Warwar	15,180	21.9
2	Kamaan Mountain Foot	33,977	10.8
3	Thibreen	15,448	58.2
4	Jobar Surrounding Al Ahsab Mosque	25,704	63.7
5	East-West Tabkhaleh	12,659	135.2
6	Makhayem Al Yarmouk (Tadman & Zahera)	46,058	118.0
7	Nahr Zahab, Dhahad & Amlar Kadim	37,055	170.4
8	Al Qutuz & Shaighour Hamiers	30,692	64.2
9	Mezze-R66	46,786	170.3
10	Mezze	46,390	95.7
11	Somariyeh	4,590	37.6
12	Dumar-Wadi Al Musbare	14,641	41.9
13	Takadon	36,750	54.5
14	Kadayya	20,800	50.0

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Figure G-3.1 Survey Area

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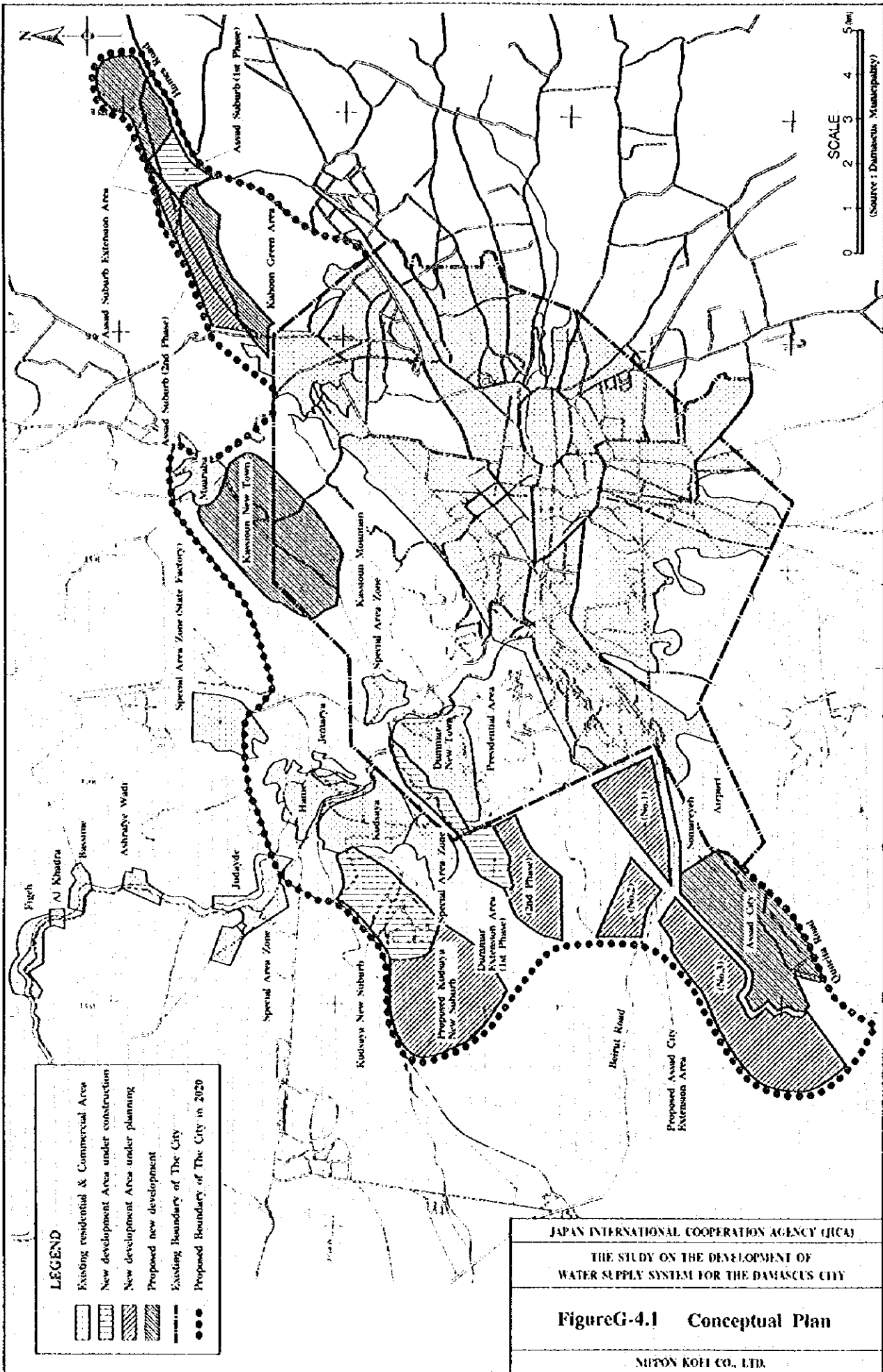
**Figure G-3.2 WORK SHEDULE**

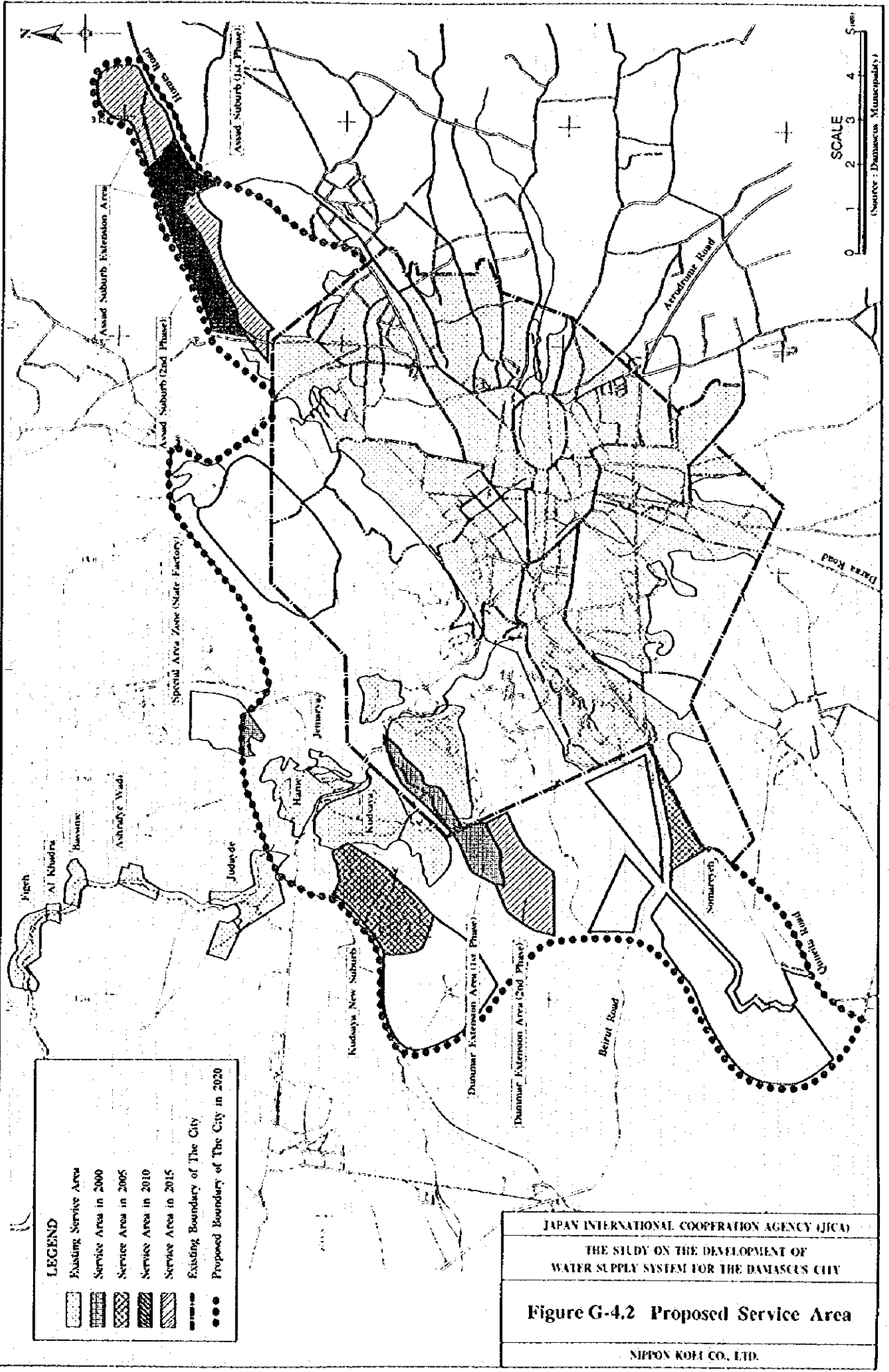
WORK ITEM	Month (1996)							
	July				August			
Preparation of Questionnare	■							
Selection of Samples		■						
Interview Syrvey			■					
Analysis of Data				■				
Report Preparation						■		

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Figure G-3.2 Work Schedule

NIPPON KOEI CO., LTD.





LEGEND	
	Existing Service Area
	Service Area in 2000
	Service Area in 2005
	Service Area in 2010
	Service Area in 2015
	Existing Boundary of The City
	Proposed Boundary of The City in 2020

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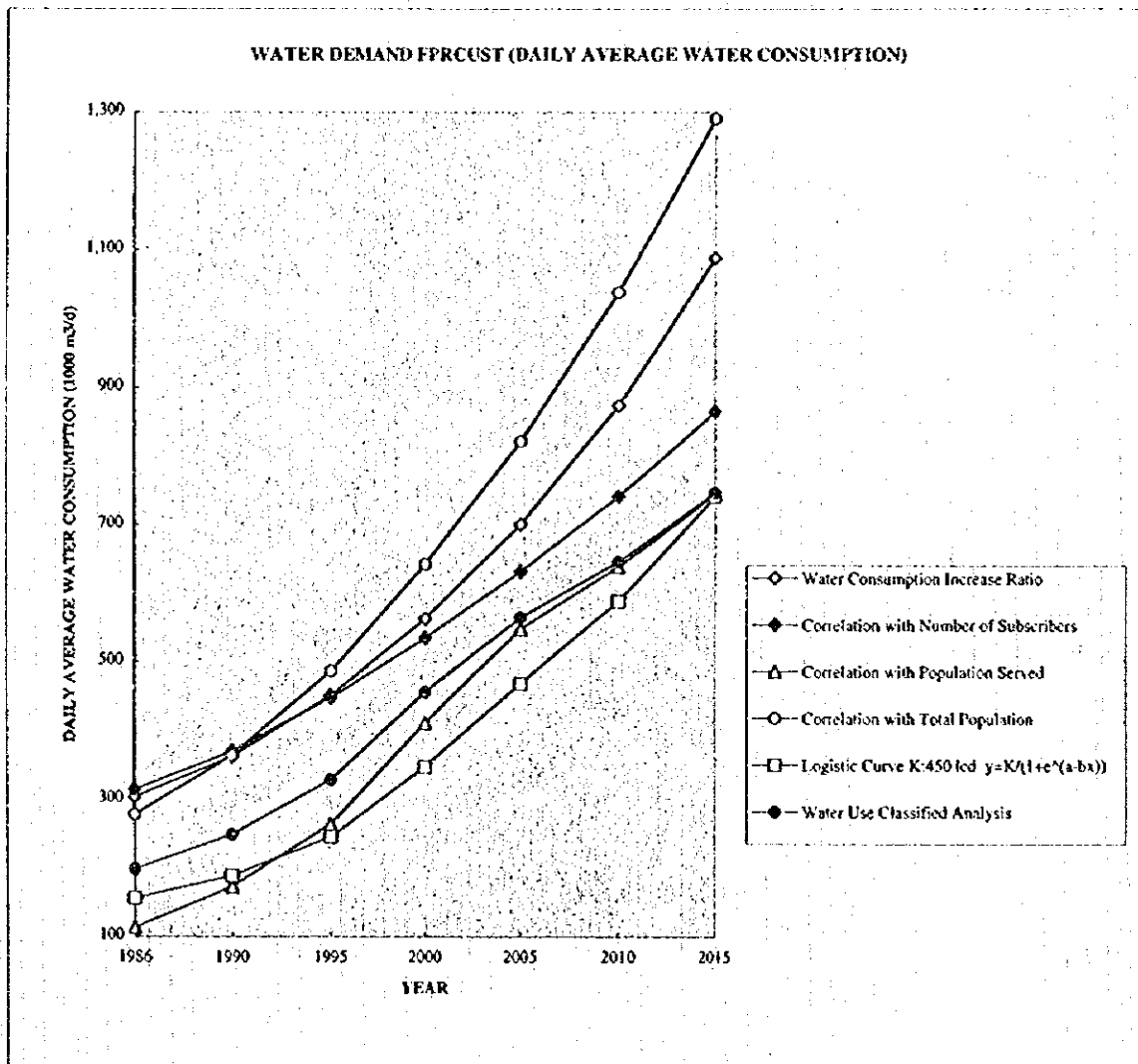
**Figure G-4.2 Proposed Service Area**

NIPPON KOHI CO., LTD.

FIGURE G-4.3 COMPARISON OF WATER DEMAND FORECAST

(Unit : 1000 m<sup>3</sup>/d)

	1986	1990	1995	2000	2005	2010	2015
Water Consumption Increase Ratio	304	362	451	562	700	873	1,088
Correlation with Number of Subscribers	314	370	447	534	632	741	864
Correlation with Population Served	113	172	264	410	547	638	743
Correlation with Total Population	278	363	486	641	821	1,039	1,290
Logistic Curve K:450 lcd $y=K/(1+e^{-(a-bx)})$	156	188	245	346	468	588	741
Water Use Classified Analysis	198	248	328	455	564	646	746



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE STUDY ON THE DEVELOPMENT OF  
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Figure G-4.3 Comparison of Water Demand  
Forecast

NIPPON KOEI CO., LTD.

FIGURE G-4.4 PAST TREND METHOD BY WATER CONSUMPTION INCREASE RATIO

(Unit : 1000 m<sup>3</sup>/d)

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2010	2015
DAWSSA's Curve	452.00	474.00	498.00	523.00	550.00	576.00	603.00	631.00	661.00	689.00	846.00	1171.00	1377.40
Theoretical Curve	303.50	317.10	331.40	346.30	361.90	378.20	395.20	413.00	431.60	451.00	562.00	872.80	1087.70
Max. Demand	345.99	361.49	377.80	394.78	412.57	431.15	450.53	470.82	492.02	514.14	640.68	994.99	1239.98

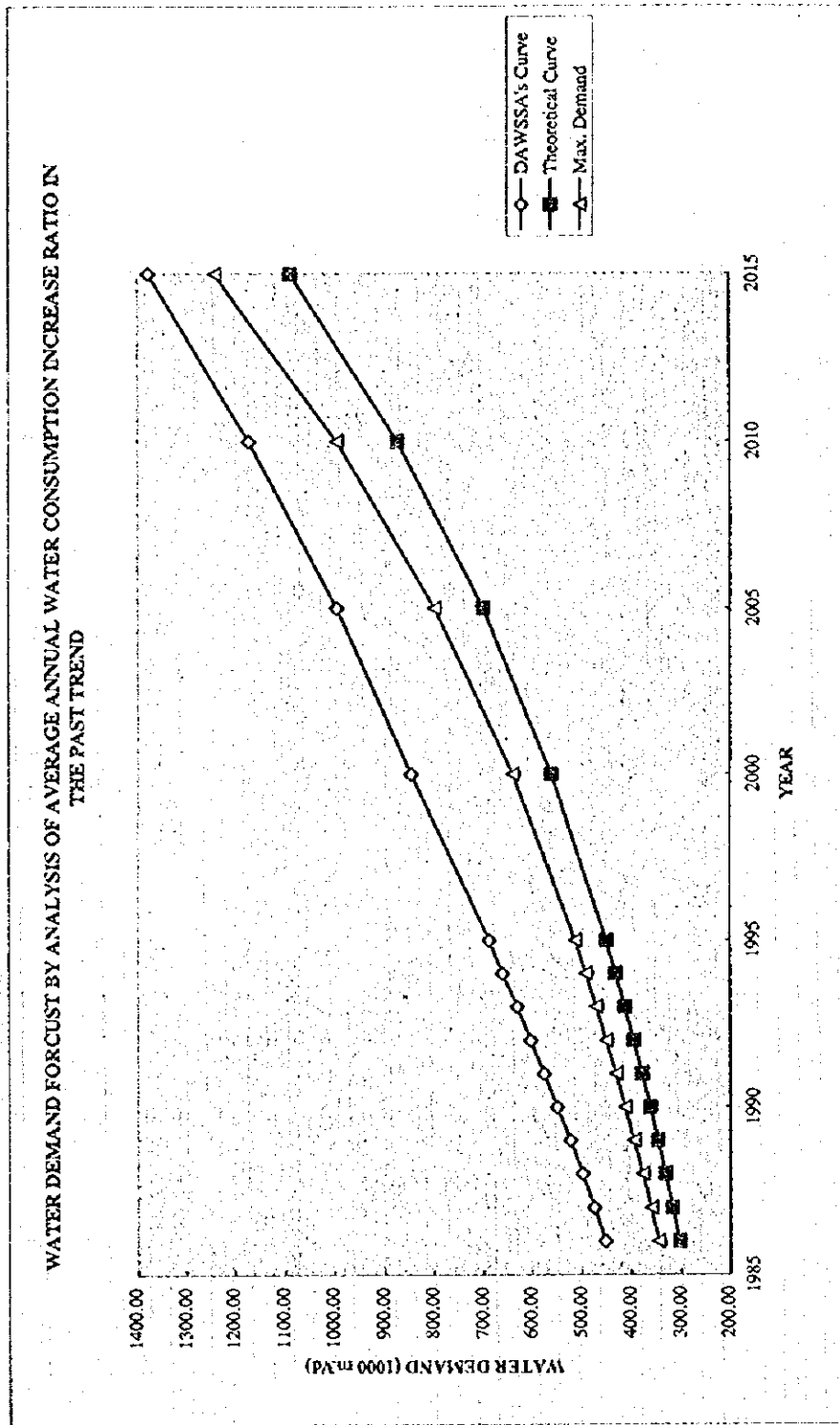


FIGURE G-4.5 CORRELATION BETWEEN WATER CONSUMPTION AND NUMBER OF SUBSCRIBERS

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010	2015
Subscribers (x1000connections)	201.7	205.41	205.83	206.19	221.24	226.1	232.55	237.94	243.47	237.81	275.1	308.48	345.918	387.895
Daily Water Consumption (x1000m <sup>3</sup> /d)	281.75	356.66	374.38	318.63	317.84	355.29	414.03	435.62	429.45	456.33	553.900	631.000	741.000	864.000
$y=2.836x-258.159$ (x:1000m <sup>3</sup> /d)	314.100	327.500	341.400	355.300	369.700	384.500	399.500	415.100	431.000	447.200	553.900	631.000	741.000	864.000

Correl. 0.8225

(Number of subscribers are forecasted based on the population growth rate from 1995 to 2020)

PAST 10 YEARS TREND AND WATER DEMAND FORCAST BETWEEN WATER CONSUMPTION AND NUMBER OF SUBSCRIBERS

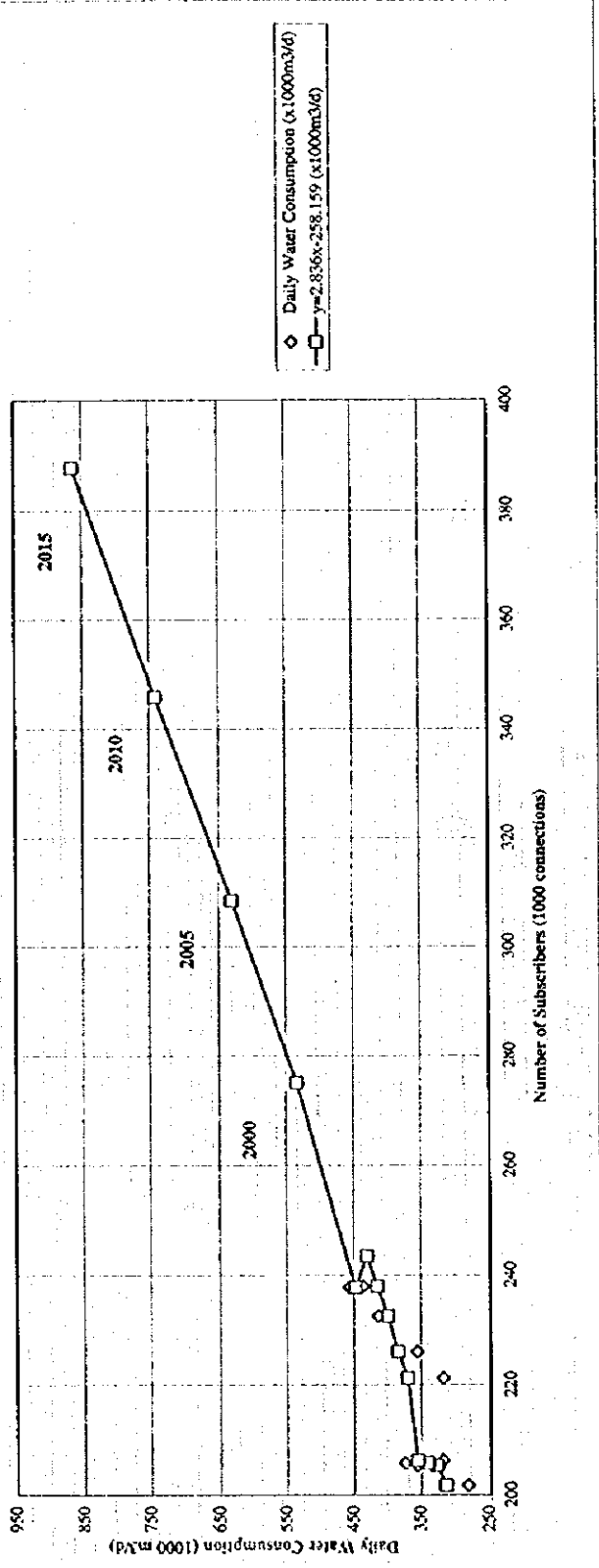
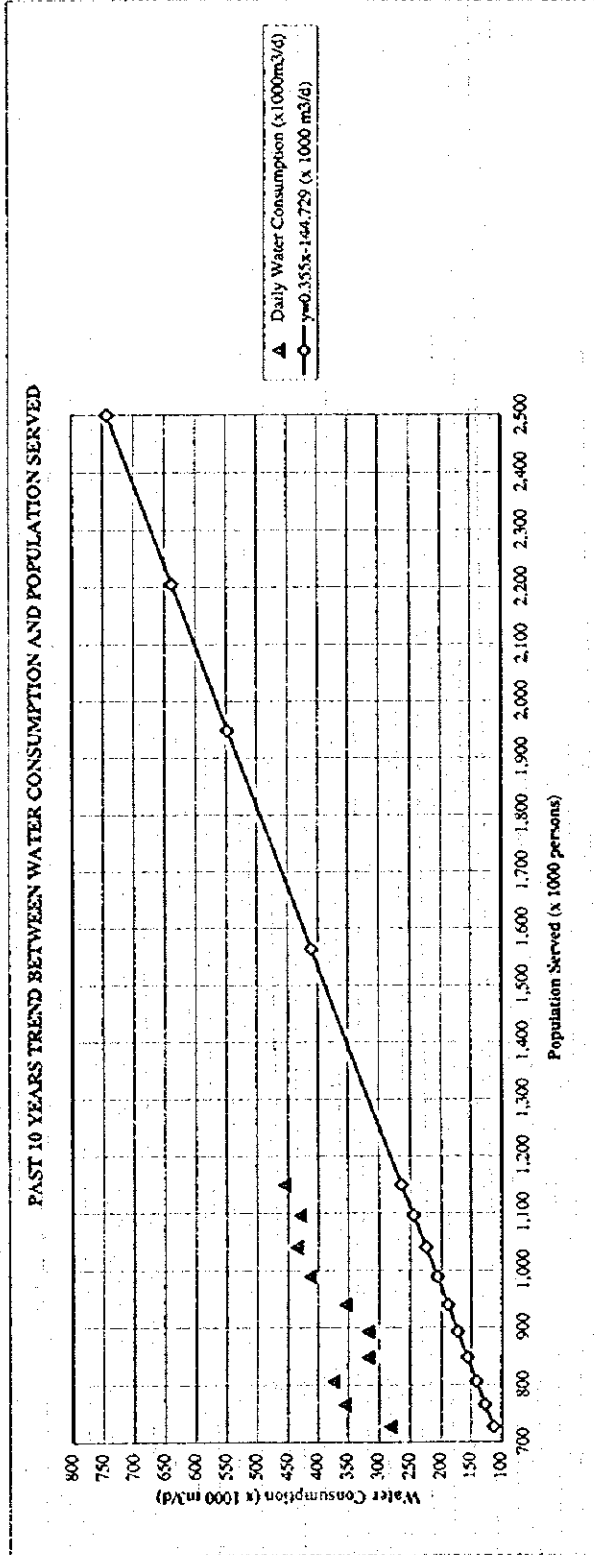


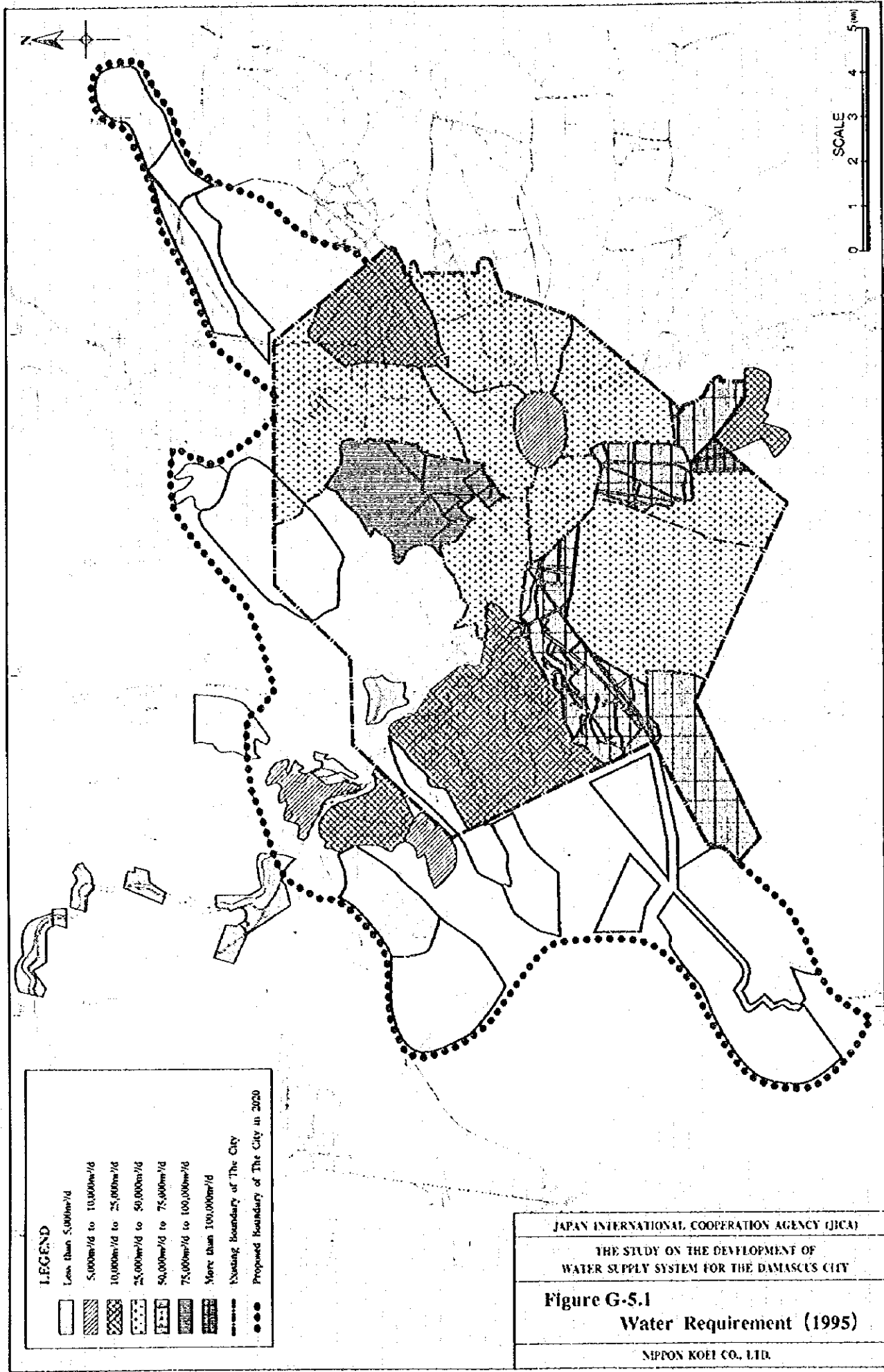
FIGURE G-4.6 CORRELATION BETWEEN WATER CONSUMPTION AND POPULATION SERVED

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010	2015
Population Served (x 1000 persons)	727	765	806	848	893	940	989	1,041	1,096	1,150	1,564	1,949	2,205	2,501
Daily Water Consumption (x1000m <sup>3</sup> /d)	282	357	374	319	318	355	414	436	429	456	410	547	638	743
$y=0.355x-144.729$ (x 1000 m <sup>3</sup> /d)														

Correl. 0.86







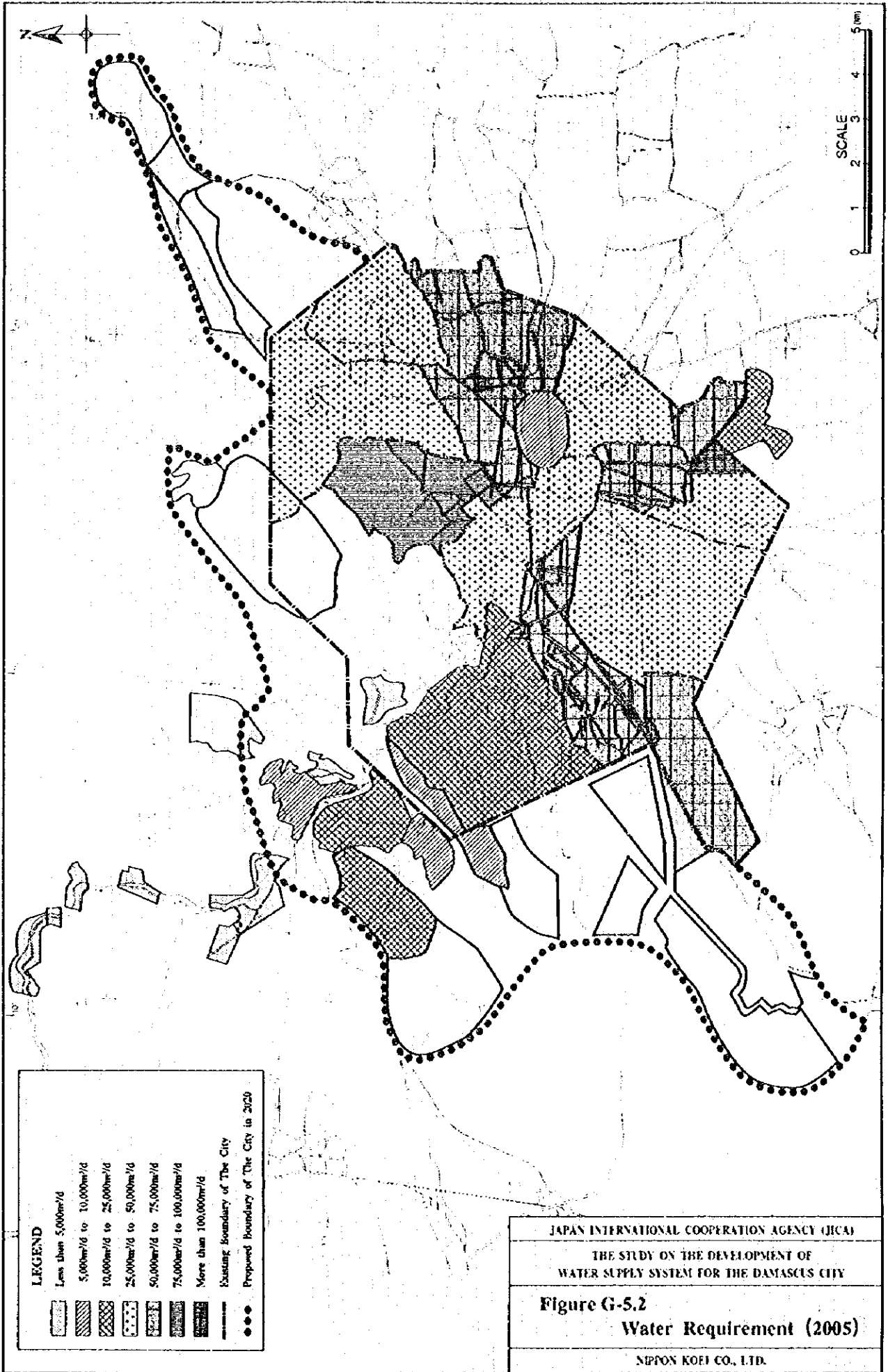
**LEGEND**

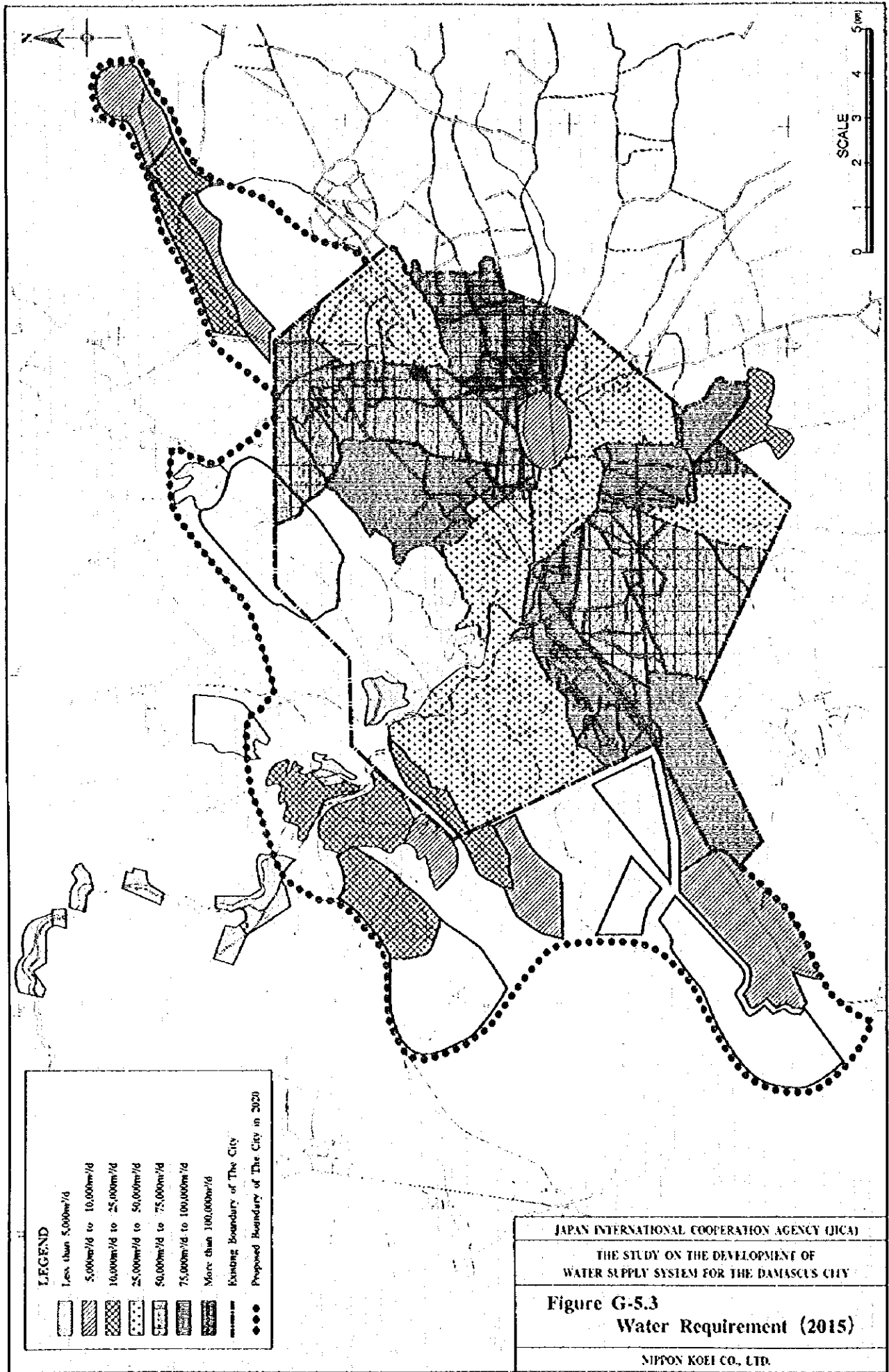
	Less than 5,000m <sup>3</sup> /d
	5,000m <sup>3</sup> /d to 10,000m <sup>3</sup> /d
	10,000m <sup>3</sup> /d to 25,000m <sup>3</sup> /d
	25,000m <sup>3</sup> /d to 50,000m <sup>3</sup> /d
	50,000m <sup>3</sup> /d to 75,000m <sup>3</sup> /d
	75,000m <sup>3</sup> /d to 100,000m <sup>3</sup> /d
	More than 100,000m <sup>3</sup> /d
	Existing Boundary of The City
	Proposed Boundary of The City in 2020

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**Figure G-5.1**  
**Water Requirement (1995)**

NIPPON KOEI CO., LTD.



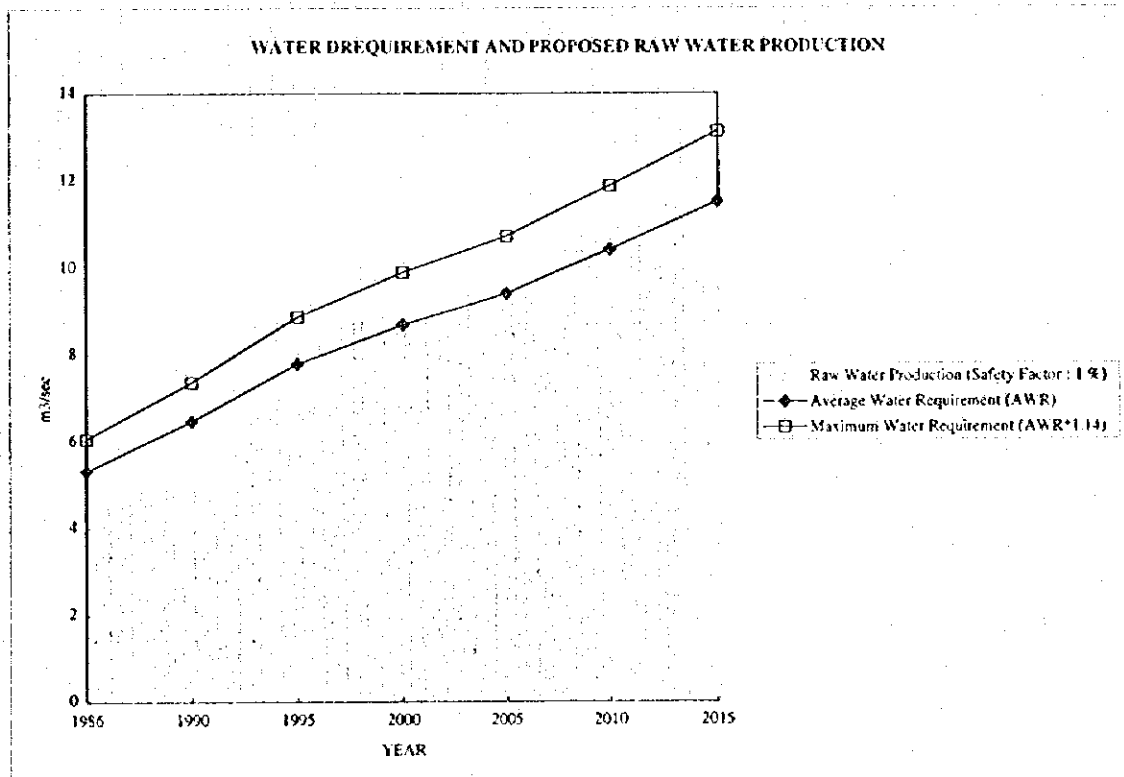


**FIGURE G-5.4 WATER REQUIREMENT AND PROPOSED RAW WATER PRODUCTION**

(Unit : m<sup>3</sup>/sec)

Year	1986	1990	1995	2000	2005	2010	2015
Average Water Requirement (AWR)	5.3	6.5	7.8	8.7	9.4	10.4	11.5
Maximum Water Requirement (AWR*1.14)	6.1	7.4	8.9	9.9	10.7	11.9	13.1
Raw Water Production (Safety Factor : 1%)	4.7	4.9	6.9	8.8	9.5	10.5	11.6

(Remark) [ ] : Assumed from the result of study on the water supply conditions in 1995



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Figure G-5.4 Water Requirement and Proposed  
Water Production

NIPPON KOEI CO., LTD.

*APPENDIX H*  
*ORGANIZATION AND INSTITUTION*

APPENDIX H  
ORGANIZATION AND INSTITUTION

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## 1. INTRODUCTION

This Appendix H addresses, in the widest sense, issues of an Organizational and Institutional nature; the material it contains forms the basis from which comments in the Main Report are drawn.

The Appendix relates to what the Study Inception Report referred to as one of the "four major tasks of the Study", namely the "formulation of an improvement plan on institutional and managerial matters for DAWSSA".

In arriving at detailed recommendations the continuing Study was required to consider the existing report entitled "Improving the Management of the Establishment" produced by the French consultants SEMA and S.E.L.E.E in 1976/7. Given the extensive resources which had been devoted to that study it was obviously sensible to use it as a starting point; in fact, most of its observations and recommendations were found still to be relevant today. This Appendix of the Final Study Report comments on the organizational aspects of the French report whilst comments on the financial plan it contained are made elsewhere.

DAWSSA's is currently discussing its organization with its sponsor Ministry (Housing and Utilities) and this Study and its proposals may prove useful in that respect.

Obviously reorganization is an important issue but so are a number of other aspects if a rounded view is to be taken of DAWSSA's opportunities for improvement in future; hence the consideration here of the other important aspects of customer orientation, management, and manpower.

The forecasts of overall future manpower requirements contained here have been derived on the basis that future improvements in organization and management will lead to improved efficiency and hence reduced demand for increases in manpower to meet ever increasing demands for water. In addition the specific manpower requirements arising as a direct result of the Master Plan are assessed.



## 2. THE INSTITUTIONAL SETTING

### 2.1 Background

There is a history of organised water supply serving the city of Damascus going back to Roman times. Then, good quality water from the natural artesian Figeh Spring some 15km north of the city and high in the gorge of the Barada river, was first led to the city by gravity aqueduct (largely in tunnel).

In more recent times the first system of piped water from Figeh was arranged by one Nazim Bacha who, in 1904, installed a 250mm pipe to feed the city. In 1924, "l'Comite des Eaux de Figeh", a committee of representatives of local citizens and local government, was able to raise funds for a more major scheme. By 1932 a new tunnelled aqueduct was conveying water to the city. This co-operative was the predecessor to the publicly owned "l'Etablissement Public des Eau de Damas (Figeh)" (l'EPEF) first set up in 1958 (and subsequently strengthened by further legislation in 1968 and 1975).

In 1984 enabling legislation was enacted to allow the scope of all water establishments throughout the Syrian Arab Republic (SAR) to be extended to include sewerage and sewage disposal; this led to the change of name from l'EPEF to Damascus Water Supply and Sewerage Authority (DAWSSA). However, this extended responsibility is only now being arranged through additional 1995 legislation which has created a company subsidiary to DAWSSA for the operation of the sewerage function.

### 2.2 The Implications of State Control for DAWSSA.

A useful document for background on the national administration is the "Organization Structure of Public Administration in the Syrian Arab Republic"; a contents list for this document is presented here as Table H-2.1

DAWSSA is subject to a great deal of detailed State control in respect of :-

**Water Resources** - generally from the Ministry of Irrigation

**Plans** - from the State Planning Commission,

**Budgets** - for operations ("ordinary") budget and for the manpower budget (cost and numbers) through the Ministries of Housing and Utilities, and Finance, and for the investment budget through the State Planning Commission.

**Tariffs** - set by the Ministry of Housing and Utilities (at uniform rates across the country)

**Staff** - the basis for pay and conditions set by Decree 1 / 1985

External Audit - appointed by the Ministry of Finance

Internal Inspection and Supervision - a required directorate within DAWSSA reporting to the Prime Minister's Office.

### 2.3 Statutes and Statutory Instruments

All the statutes and statutory instruments identified as relevant to the evolution, constitution, management, and operation of DAWSSA are listed chronologically in Table H-2.2.

There follows a brief commentary on the implications of successive documents in the Table, from oldest to most recent.

Decree #2273 and Decision #475 are important as the basis of law regarding consumer connections and charges. (Note that Decision #475 was later consolidated and updated and Decree #2273 was amended by Resolution #1988 - see entries below).

Decrees #18 and 252 are important as the basis of the constitution of the former l'EPEF and made it responsible to the Ministry of Housing and Utilities. They were the statutes relevant at the time of the French report on "the Improvement of the Management of the Establishment" (see 4. following).

Decree #14 was enabling legislation for the creation of combined water and sewerage Establishments for each of the Governorates throughout Syria. This therefore created DAWSSA in place of l'EPEF. A directorate for Sewerage was set up immediately within DAWSSA (even though that Directorate has never, so far, operated as such).

Decree 1/1985 - this "Basic Law for State Employees" was made applicable to DAWSSA by Decree #20. It gives details of starter salaries and wages, arrangements for "promotions" (increments), etc.

Decree #475 (of 1968) consolidated and updated to 1986.

Law #10 on "Protection Zones" led to the setting up of a DAWSSA Environmental Directorate. Instruction #7642/2/1 is from the Minister of Housing and Utilities about applying a uniform organization structure to all water Establishments throughout Syria; this is still the subject of discussion between DAWSSA and the Ministry.

Resolution #1988 updates and amends Decree #2273 regarding consumer connections and charges. (Note also to be read with Decree #475 (Consolidated)).

Decree #20 supersedes Decree #18 in respect of public establishments and makes many aspects and duties more specific.

Decision #58 is the latest revision of the uniform water tariffs applicable throughout Syria.

Decree #381 creates a new Company as a subsidiary of DAWSSA, responsible for sewerage operations. The process of setting up this new Company is progressing at present.

**Decree #1 removes certain restrictions whereby, upon graduation, engineers were obliged to work for the State for 5 years.**

### 3. THE PRESENT ORGANIZATION

#### 3.1 Duties, Powers, and Relationships

According to Decree #252 the Establishment is required to "take water from Figeh Spring or any other authorised resource and then be responsible for distributing it within the limits defined for Damascus and the villages of the Barada valley..". And according to Decree #14 "a Local Public Establishment shall be created ...defined as 1. General Establishment for Water Supply and Sewerage in Damascus City Governorate...".

As explained in the Water Resources section of this report, for any proposed water resource developments outside the city boundary (except Figeh) DAWSSA is required to seek licences from the Ministry of Irrigation (subject to a provision for appeal to the Prime Ministry). The Ministry may, understandably, suffer conflicts of interests, as between competing water supply and irrigation requirements and, increasingly the question of pollution control is coming into the picture but appears not to be adequately addressed. Within the city boundary the Municipality has responsibilities for licensing all abstractions other than DAWSSA's but there is no single agency with overall responsibility for co-ordination of water exploitation.

The "competent Minister" is defined as the Minister of Housing and Utilities and by Decree 20 he is responsible, among other things, for (i) the appointment of the deputy director general and the directors of both the General Establishment and its subsidiaries and deciding their internal organization (ii) deciding with the Board (in his capacity as occasional Chairman) five year and annual plans and accounts.

Both Decrees 18 and 20 state that the General Establishment enjoys "financial and administrative autonomy"; this seems very questionable, in view of the list of state controls referred to above. Also the Minister of Housing and Utilities is empowered to take over Chairmanship of the Board on the occasions when the final Plans, Budgets and Accounts are on the agenda. This in itself is a contradiction of the principle of autonomy.

#### 3.2 Board of Directors

Decree #20 says "The Board of Directors is the authority entitled to draw up the policy that will be applied by the General Establishment to reach the objective that it has been created to achieve". "Particularly, the Board of Directors is responsible for the proper implementation of the plans concerning, production, investment, exploitation, and the ideal use of the available resources for the purpose of achieving adequate return on the capital invested".

In accordance with Decree 20 the Board of Directors consists of the Director General (as normal Chairman of the Board), the Deputy Director General (who can Chair the meeting in the absence of the DG), the Directors of Finance and Planning as required members, one other executive director nominated by the Minister of Housing (currently the Director of Consumer Affairs) and two nominated Workers representatives (currently from a finance and a technical department).

Decree 20, actually appears to tighten the control of the Minister further by transferring to him the Director General's previous small latitude with (i) the nomination of Executive Directors and (ii) nominating directors and deciding organizations for subsidiary Companies and Enterprises (Article 21).

Incidentally, Article 10 of Decree 20 gives the Board an extra responsibility "for the economic management of the Establishment and fulfilling the economic profit for it"; this is hard to reconcile with the fact that the Tariff is externally imposed.

Unfortunately, Decree 20 also omits a device which has proved very useful to DAWSSA in the past; that of being able to pay "encouragement rewards" to "experts and technicians whose assistance is required" (Article 31 Decree 18).

### 3.3 Organizational Structure

The present organization structure of DAWSSA is shown in outline on Figure H-3.1 with numbers of staff. A set of detailed structure charts, with staff numbers, for each separate directorate and service department are given in Data Book 6a (with the exceptions of the Internal Inspection Directorate which has just two staff and the Public Relations Department which has one only).

DAWSSA consists of 15 main directorates in all, together with the General Directorate and 2 service departments (Water Quality Control and Public Relations). There are 9 technical directorates (8 for Water Supply and one for Sewerage), 3 for Finance, and one each for Planning, Administration, and Internal Inspection.

Compared with the model set of directorates recommended by the recent Instruction from the Ministry of Housing and Utilities for each of the 14 water and sewerage establishments throughout Syria DAWSSA has too many directorates and this is currently the subject of formal discussions. Table H-2.3 sets out a comparison of the required and actual situation.

The extent to which the organization now reflects the recommendations of the "French Report" is discussed below in Section 4. following. Since that incomplete attempt at restructuring it seems clear that the present structure has been allowed to evolve to match the needs of the moment without reference to any overall strategy and with the main expedient being the need to retain valuable staff by building the structure around them. Hence the structure is fragmented and has many overlaps (particularly in the technical area).

More than 20 formal interviews were held with heads of departments as well as numerous informal interviews; there follow observations on the most obvious structural anomalies which were identified from the interviews and with the benefit of further discussions within the Study team:-

Maintenance Directorate - deals only with the maintenance of buildings, structures, vehicles and mobile plant. Maintenance of fixed plant is dealt with by Production or Standby-wells Directorate as appropriate. The possibility of rationalising these arrangements should be considered.

Standby-wells Directorate - the origins of this as a separate directorate seem to go back to the times of the Arab-Israeli Wars in 1967 and 1973. It operates as a separate unit (even to the extent of being housed in separate offices) and has responsibilities for (i) emergency wells unconnected to the network and (ii) for some wells that are connected (being responsible both for their operation and maintenance). The rationale and justification for keeping this as a directorate separate from Production is not clear and should be reconsidered.

Water Quality Control Section - this section comprises separate units for the laboratory and for disinfection operations which were separated from the Production directorate at different times for reasons of expediency. This is unsatisfactory as a long term solution and should be reconsidered.

Sewerage Affairs Directorate - is not undertaking the work its title suggests (since so far DAWSSA has not assumed responsibilities for sewerage); it's full staffing of some 20 engineers is, in fact, involved in supervising and commissioning water distribution works to "informal developments". These works are designed by the Studies and New Contracts Directorate and it would seem sensible for the situation to be rationalised by merging the staffs (but depending upon the outcome of changes occurring as a consequence of DAWSSA now assuming responsibility for sewerage).

Water Resources Directorate - this was separated from Production because of the criticality of the search for new water resources. However the possibility of combining this directorate with the Studies part of the Studies and New Works directorate should be examined.

Environment Directorate - this was created to undertake the work arising as a result of Law 10 of 1989 setting up the Fiqh Protection Zones. The approach has been defined by external consultants and now the section's engineers act mainly in supervising sewerage construction

contracts. This work seems more appropriate to that of the Studies and New Works directorate and consideration should be given to merging the main body of engineers into that directorate whilst identifying just two or three specialists to deal with protection zone surveillance, policy and administration.

Main Projects Directorate - is only intended to continue to exist for the period of the realisation of the SCADA (telemetry and automation) project - an estimated three years from now. Thereafter the specialist staff should be considered for redeployment where their specialist knowledge can be of best use to DAWSSA (perhaps in a new Informatics department?).

Computer function - this is at present divided between (i) the billing and accounting computing on one machine which is the responsibility of the Accounting directorate and (ii) technical computing involving the Unix run network for management information and some separately networked PC's which are the responsibility of the Studies and New Works directorate. The time is inevitably approaching, as computing activities develop, when a specialist computer section (directorate?) will be required to oversee these matters.

Personnel function - different aspects of this work are split between the directorates of Administration (the keeping of individual general records on personnel), Finance (the keeping of remuneration related records for individuals), and Planning (the collating and reporting of manpower plans). The possibility of merging these into a comprehensive Personnel department (within the Administration Directorate?) should be considered.

Training function - this seems very undeveloped and disorganised with overall responsibility nominally with Planning directorate but final responsibility for the new Training centre at Al Kadam not clearly defined. There is much scope for developing this function as an essential aspect of an overall personnel function.

Public Relations function - currently this activity seems underdeveloped and should be reviewed to make best use of it.

### 3.4 Staffing

Over the past 10 years (1985 to 1995) staff numbers have been fairly constant - within a band of about 1200 to 1300 which probably reflects tight government ceilings on manpower.

The number of staff in post in March 1996 were, 1166 permanent, 90 temporary (mainly to help with peaks) and 84 contract (mainly labourers, from the State contracting organization RIMA, used on distribution work). The total of 1340 compares with the ceiling set on total manpower numbers by the Ministries of Housing and Utilities, and Finance for the current year (1996) of 1372 (both include for temporary and contract staff).

A useful manning efficiency ratio is that of employees per thousand water supply connections (on the basis of one connection per household); for DAWSSA that ratio is

approximately 5.4 / 1,000 at present (1,350 staff / 250,000 connections). At first sight this ratio appears reasonable in comparison with those of other water supply undertakings elsewhere in the world, however, it must be recognised that there are some shortfalls in manning within DAWSSA, for instance notably in respect of meter-readers.

A summary of the present staffing of each directorate is set out in Table H-3.1; for clarity this is presented using some revised job categories which do not generally correspond to those used by DAWSSA. In fact, DAWSSA do not seem to have a comprehensive system of job categorisation, probably because of the emphasis put on staff qualifications (see comments in the following section) rather than the actual job undertaken.

The base data for this breakdown of present staffing is contained in Data Book 6b where it is presented in accordance with DAWSSA's recording system and the approach used in transposing between the systems of job titles is explained there also.

### 3.5 Pay and Conditions

In common with the rest of the public sector, pay is almost entirely dependent on qualifications and seniority; little differentiation is made in basic pay for assuming managerial responsibilities.

Levels of starter pay for different public service grades are set by Decree 1/1985 - Basic Labour Laws for State Employees. Incremental increases ("promotions") are paid every two years up to a maximum of 9% depending on performance over that period; the possible level of increase can be 0, 5, 7, 9% according to the manager's recommendation.

Pay rates in the public sector are deplorably low being in the worst cases only one quarter of those for comparable jobs in the private sector. As a consequence many public sector employees seek to augment their income by extra work which must mitigate against efficiency.

Evidence has been cited that the only time that l'EPEF or DAWSSA has made real forward strides was when realistic pay rates were permitted by the State for achieving required targets e.g. the construction of the second aqueduct tunnel and Walli reservoir scheme and the clearing of a backlog of meter repairs. Unfortunately it appears that the legal provision to do this has now been withdrawn (see Section 2.2 previous).



There are a few compensatory benefits which accrue for working in the public sector i.e. medical and child care, and possible subsidised housing; in addition directors get certain privileges such as cars provided.

### 3.6 Training and Education

It is immediately obvious is that there is a preponderance of engineers among the DAWSSA professional qualified staff. In fact, until very recently, graduate engineers have been allocated to DAWSSA by the State as part of the system whereby an engineer must work for the State for 5 years after graduation. However this requirement has very recently been removed by Decree 1/1996 (see Section 2.2 previous).

Only a very limited amount of training appears to be undertaken either in-house or external to DAWSSA; generally speaking the training seems to be addressed at the privileged few rather than the needy many.

#### 4. REVIEW OF THE PREVIOUS STUDY

This refers to the major study undertaken by the French consultants SEMA (Metra International) and SLÉE (Société Lyonnaise des Eau) in 1976/77 which was identified in the JICA Inception Report as potentially useful both in respect of its study of the organization and for the Financial Plan it was said to contain. The Report covers more than 700 pages in 5 Volumes written in French; the volume titles are as listed in Table H-4.1.

In general terms, even though the Report is more than 20 years old, it is clear that it is soundly based and could be useful as part of the present study in a number of limited respects; for certain of its findings, methodologies, and recommendations.

##### 4.1 The Financial Plan (Volume 2).

This develops forecasts of water use and finances for the period 1975 to 1985 as a way of taking a view of the likely development of the Establishment in the future; this is not strictly a "financial plan". These aspects of the French Report are commented on in more detail elsewhere in this Study Report.

##### 4.2 The Reorganization Plan (Volume 3).

This considers the Establishment to be unfocused in two main respects:-

- (i) overall - not concentrating sufficiently on what should be its main objective, "supplying drinking water to the inhabitants of Damascus" and
- (ii) each directorate - failing to restrict itself to its own specialist affairs.

The original recommendations to address the lack of focus were that a directorate called Exploitation should be created to deal with water supply from source to customer tap (and to include payment) - this should be the foremost directorate of four and the other three should be the supporting directorates (for Studies and New Works, for Finance, and for Administration). This proposed approach was modified at the request of the Establishment by splitting-off a fifth directorate for Customer Affairs from the Directorate of Exploitation.

Other important restructuring proposals in the Report were to (i) coalesce the dispersed aspects of Personnel and Training into a whole to be able to address the human resources function in a comprehensive fashion and (ii) consider the formation of an "Informatics" department.

The effect that the proposals would have had on the Establishment existing in 1976/7 are described in the translation of the Report's Main Conclusions reproduced here as Table H-4.2.

In the event, the recommendations for restructuring were not adopted as a whole, but today's organization shows that some parts were; most significantly by the creation of the present Directorate of Customer Affairs. Certain lesser items have also been implemented, for instance, the transfer of various functions to Administration from other directorates. No action has yet been taken on the important proposals for Personnel, Training, and Informatics

#### 4.3 Other Significant Findings

(i) There was serious dissatisfaction among employees with the organization (and to the extent that some senior staff said they would resign if they were permitted to do so). This dissatisfaction related to organizational shortcomings and/or the depressed level of pay. It was emphasised that it would be desirable to first overcome the pay problem in order to ensure the best outcome for the proposals for reorganization.

(ii) Customer contact needed to be improved in a number of respects, such as, the new Exploitation Directorate being required to monitor public reaction following incidents and distribution modifications and the proposed new Exploitation Centres being manned to cover not just the collection of customer payments but all subscriber service (including meter reading, billing, and collection) and also financial and local 'distribution' matters.

(iii) The systems for authorising expenditure and recruitment were too bureaucratic and remote from the action.

(iv) There was a lack of a planned approach in most aspects of the business

(v) There were critical delays in collecting payments

(vi) The levels of stock holding and water leakage needed to be reduced.

(vii) "The custodianship of the Minister of Housing and Utilities is far too extensive and heavy" and that "If the Council (Board) comprised representatives of the Ministries of Housing and Finance as well as representatives of the City of Damascus interested in the activities of PEPEF then the custodianship of The Minister will be lightened and consequently the Establishment will enjoy greater freedom".

(viii) Consideration should be given to concentrating the role of engineers in the Studies and New Works Directorate on project identification and programme management only whilst retaining external consultants to take full responsibility (subject to exception monitoring) for detailed design and for supervision of construction.

(ix) The Stores function should be transferred away from Finance.

These few issues have been selected for mention here, from the many referred to throughout the French Report, since they are major issues which are just as problematical today as they were then.

## 5. INSTITUTIONAL DEVELOPMENT AND HUMAN RESOURCES MANAGEMENT

### 5.1 An Integrated Approach

There is no doubt that much could be done for the DAWSSA "establishment" to improve its current efficiency and effectiveness by bringing the institution, organization, staff, management, and equipment up to "best modern management standards".

DAWSSA's effectiveness is currently hampered by certain institutional issues;

- the incomplete regulation of water resources on a regional basis (quality as well as volume)
- the restrictive regulation of Public Institutions (which appears to act counter to the intention that DAWSSA be autonomous and economically self sufficient).

At present DAWSSA is in the process of assuming responsibility from the Municipality for the sewerage function for the city. The detailed effects of this expansion are not clear at present but in any case they are outside the scope of the study. This development must however affect the establishment in the short to medium term. Effects may vary from, the need for the DAWSSA Board to direct the sewerage function, to the possible joint use of support services such as engineering, finance, or administration.

Certain serious operational problems are currently of paramount significance for DAWSSA's finances and water availability, namely

- high levels of unbilled water
- an acute backlog of revenue for collection
- an acute backlog of malfunctioning customer water meters for replacement
- high levels of losses from the water supply system

There are a number of issues of organization and management which are immediately apparent as affecting the efficiency of the establishment; namely,

- low pay (which applies throughout the public sector)
- a pay system based almost entirely on qualifications and length of service
- very protective labor laws
- a very bureaucratic style of management
- lack of forward planning in many areas of work
- absence of coherent approaches to Personnel, Training, and Information Technology functions

In addition there is a major internal issue for DAWSSA regarding its dealings with customers; it should try to become more 'customer conscious' if it is to improve its effectiveness.

Most of these same issues were identified twenty years ago when the French report on "the Improvement of the Establishment" was produced and they are still as evident today. So what is the solution to these challenges?

It is only possible to state a view on those issues which appear to need Government intervention and ask for them to be considered; this applies to the questions of

- (i) interaction with other Public Institutions and Government
- (ii) the labor laws as they affect pay, rewards, and dismissal.

If the questions of staff pay and conditions can be got right then the way should be clear to motivate the staff by improvements within the organization; to structure, to management, and to training. Of course, those same organizational improvements could be put in place without removing the staff demotivators but the likelihood is that the improvements would be difficult to implement and far less effective.

With a better motivated workforce the efficiency of the organization would be much improved on day to day running especially if better equipment was available to best modern standards. In addition it should be possible to tackle the physical challenges identified by this Study Team by seeking the co-operation of the staff to give extra effort over and above that required for the normal operational activities. Hopefully, this should give the staff extra job satisfaction whilst minimizing the need to recruit extra staff.

It is apparent that only by tackling all the deficiencies of organization, manpower, and management, as an integrated whole can the best benefit be achieved for DAWSSA. In order to understand the path that DAWSSA might follow in the future in moving towards a position of 'best modern practice' a 'Present State - Desired State analysis' (see Table H-5.1) was prepared and discussed. 'Best modern practice' is taken to be that which currently applies in the most developed countries of the world.

Such internal improvements can only happen gradually over the twenty year period under consideration. Furthermore the rate of change of DAWSSA will be affected by wider political, social, and cultural changes in Syrian society as a whole so that it is difficult to forecast the likely rate of change. For the purposes of the manpower forecasting the efficiency savings expected to arise during the period has been taken as a fixed negative percentage per annum arising from the year 2000 on.

There follows a discussion on the main current problem areas and the challenges for DAWSSA in the future which for this purpose have been grouped according to (1) Customer Orientation, (2) Organizational Structure, (3) Management, and (4) Manpower.

#### 5.1.1 Customer Orientation

In the past, Damascus appears to have enjoyed an enviable availability of water compared with most other areas of the Arab world; the present situation is no longer so good. There is a perception among the inhabitants of Damascus that the water supply levels of service have deteriorated over the last 10 years or so. This is related to the increasing frequency of interruptions to supply during the dry season, from August to September.

In fact, in recent years, it has been DAWSSA's practice during the dry season to cut off the Fijeh supply to the City throughout the night at the outlet to the main reservoirs in order to ensure that they were full to meet the morning peak usage.

Some relevant estimated information on the present situation, taken from a sample survey of residents (see elsewhere in this report), is ;

- about 72% of the present households in Damascus are billed by DAWSSA
- 85% of the residents have water storage to provide against shortages
- 29% have suction pumps from the mains to provide against low pressures
- 83% get water at some time every day
- 55% receive water for less than 12 hours per day in the dry season
- 13% complained of poor water quality and 9% of low pressure.

DAWSSA appears to prepare few statistics such as these regarding the levels of service it provided to customers. Some rudimentary information of this type is, however, provided to Government in the 5 Year Plan but there is no indication that any active use is made of this in monitoring DAWSSA's performance nor is it made public. DAWSSA gives the impression that it is not generally very customer oriented and more effort should be put into remedying this in order to improve its overall effectiveness.

Level of service information is essential to the good management of a modern water undertaking since it is on such information that the physical performance of the monopoly can be judged. It is recommended that DAWSSA embraces this approach by

- developing systems of measuring, recording, and reporting the levels of service achieved against standards it sets for itself

- publicizing its target standards and its achievements against these (in terms of the level of service indicators) by way of a publicly available annual report.

A further important item to consider is the interface with the public on customer contacts; there is a need to improve the receipt, channeling, recording, and reporting of customer reports and complaints. It is recommended that all such contacts be fed through just one central clearing section, say at Head Office, and that they be recorded and performance in addressing them be regularly reported to, and considered by top management.

While these proposals should form a vital base for improving customer orientation, there is need for a more widespread and far reaching change in the culture of the organization essentially away from the present technical orientation.

It will be useful to test for improvements in the public's perception of DAWSSA by undertaking sample surveys from time to time.

#### 5.1.2 Organization Structure

"It is worth repeating that there are no absolute standards against which an organization structure can be judged. There is never one right way of organizing anything and there are no absolute principles which govern organizational choice. However attention needs to be paid to a number of issues such as groupings and decentralization, the span of control of managers, overlaps or neglect of activities and the existence of unnecessary units or layers of management" (Armstrong - 1995).

From an examination of the current organization chart for DAWSSA (see Figure H-3.1) certain general issues are immediately apparent; the organization is fragmented into many separate directorates and the span of control of the General Director is excessive (1 to 17). In addition it has been observed that there are a number of areas of overlap - particularly in the area of maintenance. The effect of the fragmentation must be to cause the organization to lose sight of its primary objective; that of supplying water to the inhabitants of Damascus; this is apparent in the lack of customer focus commented on previously.

To overcome this, an organization consisting of as few directorates as possible is recommended, ideally just four; one directorate covering the core of the business i.e. delivering water from source to tap, supported by directorates for the main functions of finance, technical, and administration. However a slight increase over the ideal number of directorates would be acceptable in the light of the resistance there was to this recommendation originally made by the French in their 1975 report on "the Improvement of the Management of



the Establishment" (which led to the creation of a directorate of Consumer Affairs) and with the knowledge that all Syrian public bodies are required to have directorates of Planning & Statistics and Internal Inspection. At some time in the future the climate may be right to achieve further reductions towards the ideal.

The Minister of Housing and Utilities is in the process of reviewing the structures of water undertakings in each of the 14 Syrian Governorates and of DAWSSA in particular. DAWSSA's recent response to the Minister (some details of which are included in Data Book 6d) incorporates a proposed structure (largely following the 'model' one he had originally had suggested). Adopting the changes proposed would be a useful first step in restructuring and would prepare the way for medium term proposals made here.

The most obvious effect of the DAWSSA proposals is to reduce the number of directorates from 16 to just 8. The reduction in directorates has been achieved by the creation of a 'core' directorate for "Exploitation & Maintenance" (incorporating Production, Standby Wells, Distribution, and Maintenance & Parking) and a more extended directorate of Studies & Construction (incorporating Major Projects, Water Resources, Environmental, and Sewerage). This approach would be useful.

Under the Directorate of Exploitation and Maintenance the existing directorate structure is essentially preserved at the next level down in the form of the Departments of Production, Standby Wells, Distribution, and Maintenance & Parking. In the medium term further rationalization and development from this base is recommended, as described in the following; these changes are intended to address the identified structural anomalies described earlier.

### 5.1.3 Management

The term 'manager' seems little used within DAWSSA; the impression is that those managers below the level of director occupy the positions reluctantly because there is little incentive to accept the extra responsibility involved and little opportunity to act in an empowered way.

The remuneration system reflects only qualifications and seniority with little scope to reward for any extra responsibilities taken. There appears little accountability for performance against targets or budgets and no involvement for motivating and developing staff, say through team building or training. Indeed it seems that DAWSSA managers think of themselves as "technical professionals with some peripheral management responsibilities".

These are the people on whom DAWSSA depends for its success in the future and there is an important requirement to develop them into fully rounded managers responsible for planning, organizing, and controlling work through the best use of staff. Reluctance to take decisions needs replacing with appropriate authority linked to accountability; pre-occupation with detailed checking and control with delegation and forward planning; and excessive paperwork with sensible computer based recording. For all of this to be achieved there will need to be radical changes in the approach to management in DAWSSA and top managers must be prepared to empower their subordinate managers.

The implementation of an overall management development programme worked is suggested; this should be worked in parallel with individual development plans arising from a system of regular appraisal of performance. This programme could be developed with outside assistance, from say a suitable consultancy or an academic institution. It may be possible to use in-house facilities but it is unlikely that the Training staff, soon to be recruited, would have the right backgrounds to develop and run the programme.

#### 5.1.4 Manpower

According to Herzberg's theories of motivation it is necessary to remove the demotivators before considering the motivators. Certain demotivators he refers to as 'hygiene factors' (remuneration and working conditions); improving these to a satisfactory level removes the demotivators but will not, in itself, act to motivate staff; that depends on ensuring job satisfaction, etc.

There is a major demotivator for DAWSSA staff at present with in the form of the very low pay (a problem common throughout the public sector). This leads to a great many of the staff at all levels taking second jobs to supplement their basic income. The other demotivator involves the remuneration system which is entirely based on qualifications and seniority and offers no incentive to assume management responsibilities. There are obvious difficulties in meeting these problems head-on but every possible effort should be made to find a way around them, if necessary by involving the responsible Minister (Housing and Utilities). In addition there is the question of public servants being virtually guaranteed 'jobs for life'; this can tend to remove the motivator of being required to perform satisfactorily.

The main motivators should involve enhancing the job satisfaction for staff; this could be achieved through their greater involvement in the organization and through satisfaction in their achievements made possible by more delegated responsibility, improved organizational structures, better training and development, team building, meaningful performance appraisal, regular briefings, and so on.

## 5.2 Proposals for the Organization and Manpower

### 5.2.1 Re-structuring

The recommendations on restructuring for the medium term build from the proposals already submitted by DAWSSA to the Minister of Housing and Utilities which would form a useful first step. Those proposals reduce the number of existing directorates overall from 16 to just 8. Further rationalizations and developments are proposed from that base. It is proposed to include one new directorate (of Information Technology - I.T.) then giving a total of 9 directorates plus the General Directorate. Restructuring proposals are discussed below and their development is shown diagrammatically in Figure II-5.1.

#### (1) Medium term rationalization of the structure

##### (i) Operations and Maintenance

The combination of the existing four directorates of Production, Standby Wells, Maintenance and Parking, and Distribution into one new directorate should produce more focus on the core activity of the business, that of producing and delivering water to the customer. This new directorate is named by DAWSSA "Exploitation and Maintenance" whereas it would be better called "Operations and Maintenance".

Within this directorate are recommend Departments of Production, Distribution, and Maintenance. The Department of Production should include, as a section, the Disinfection part of the present Water Quality Control department (whilst the Water Quality Analysis function is retained as a department within the General Directorate to maintain an independent reporting role). The position of Standby Wells should be rationalized by incorporating its "Investment Wells" function into the new Production department, by creating a new section for Emergency Wells (again within the Production department), and by dealing with maintenance through a new Maintenance Department with four sections; for electrical fixed plant, for mechanical fixed plant; for buildings and structures; and for vehicles and mobile plant.

In view of the type of work involved in administering and allocating vehicles, consideration should be given to transferring the Parking function ( 3 staff and 82 drivers) of the present Maintenance and Parking Directorate to the Administration Directorate

(ii) Studies and Construction

The incorporation of the existing directorates of Major Projects, Water Resources, Environmental, and Sewerage into Studies Directorate should rationalize the approach to the technical planning support function.

The current Major Projects Directorate is now dealing exclusively with the development and implementation of the SCADA project; it is already decided that at the end of this project the directorate will be disbanded. The move into the Studies Directorate should, however, only be temporary until the creation of a comprehensive new directorate for computing and telecommunications which is recommended later.

The present Water Resources and Environmental directorates should fit logically as new units within the Studies directorate. The transfer of the present staff of the Sewerage directorate may only be a temporary measure since it is likely to be affected by the imminent creation of the Sewerage Company within the DAWSSA establishment. If these present staff of 20 are, in fact, transferred to the new Company as is being suggested, then alternative provision of engineering staff will need to be made since they play a vital role now and in the Master Plan proposals undertaking the design and supervision role on mainlaying to the "informal areas"

(2) Medium term development of the structure

(i) Establishment of Information Technology

There is an obvious need in the organization to address a number of issues of computing and information in a co-ordinated way. The present separation of technical and financial computing; the embryonic Management Information System; the imminent SCADA system; the proliferation of PCs (personal computers) and their associated independent data bases; the emerging need for centrally held data (as exemplified by the discussions on a data base for personnel records); the possibility of data capture devices for use by meter readers, all of these point to the need for these matters to be brought together in one unit. A new directorate of Information Technology is proposed which should allow a strategic view to be taken of hardware, software, and information systems development.

(ii) Establishment of Personnel and Training functions

Ideally in order to give these functions the emphasis they deserve a separate directorate for Human Resources would be recommended to deal in a co-ordinated way with Personnel and Training matters; however, it does not seem that the organization is ready for such a move.

For the medium term therefore, the recommendation is for the creation of separate departments for Personnel and for Training within the Administration Directorate.

The Personnel Department should have a co-ordinating role for manpower; for its review, administration, and forecasting. The Planning Department could look to this department for the Manpower Forecasts for inclusion in the 5 Year DAWSSA Plan.

There are many obvious benefits which DAWSSA could obtain from a serious approach to training. The time is right, in view of the imminent completion of the new Training center at Al Kadam, for the reinforcement of the Training function. It is therefore propose that a Training Department be created as soon as possible within the Directorate of Administration to work closely with the proposed new Personnel Department.

The possibility was discussed with DAWSSA of making immediate progress on a project to implement training. Ideally they could benefit from some expert assistance in implementing this development.

(iii) Reinforcement of the Public Relations function

The role of the present Public Relations (PR) service department within the General Directorate is restricted to liaison and assistance to foreign visitors (consultants and others). It is proposed that the role be extended to incorporate the interface with the public on matters of 'demand management'. This would involve designing and presenting material to communicate to the public through the 'media' (via the written word, radio, and television) the imperative need to reduce the waste of water.

There would be need for close liaison between PR and the Distribution function and with proposed new groups for Customer Liaison (dealing with customer reports and complaints) and for Water Liaison (advising the major water users on best use of water).

### 5.2.2 Forecasting Manpower Requirements

(1) The DAWSSA manpower forecast

The Planning and Statistics Directorate of DAWSSA have produced manpower forecasts as part of their recent draft 5-Year Plan submission to Government. They propose a steady increase from 1332 staff in 1995 to 2257 in the year 2000. This large overall increase (nearly 70%) is derived from the sum of the proposals put forward by the individual directorates to which a overall small reduction was then applied. The process seems very

arbitrary given that it is based on an uncritical acceptance of the 'bids' of the individual directorates and a final speculative adjustment.

(2) The Master Plan manpower forecasts

(i) Underlying growth

It seems reasonable to assume that growth in the number of water connections should follow, or be more than, the rate of growth of population - in the recent past this has been some 2.47% pa and it is forecast to continue at that rate. If it is assumed that there were no improvements in efficiency, there are some parts of the organization which might follow the population growth closely - for instance, Distribution, Consumer Affairs, and the billing part of Accounting - whilst other parts, such as Production, would probably reflect a somewhat lower rate of growth, and others like Finance and Administration would reflect an even lower rate.

In view of the reasonable starting position of 5.4 staff per 1000 connections, an annual 2.47% rate has been applied from that base in order to assess the future underlying rate of growth staff but that assumption has been modified by assuming future reductions due to efficiency improvements - see the following. The question of natural turnover and wastage of staff is not reflected in these figures; that would, of course, have the effect of requiring even more recruitment than the increased figures appear to imply.

As discussed previously there is much scope for DAWSSA to improve its efficiency by moving towards "best modern management practice" in many aspects of its operation; such efficiency improvements will show up in better manpower productivity and hence reduced manpower (or at least reduced manpower growth). It will be some time before a momentum of efficiency builds up and so it is assumed that there will be no manpower savings in the short term (the first 5 years); thereafter a 2% saving on total manpower year on year has been assumed for the remaining 15 years of the Master Plan Period up to the year 2015.

(ii) Manpower specifically for the Master Plan

These are specific manpower requirements which are likely to arise from this Master Plan proposals; they are discussed in more detail following and summarized in Table H-5.2. The staff are required;

- to supervise the proposed investment programme;
- to implement the unaccounted for water projects;
- to improve the meter reading, billing, and collection
- to implement the information technology proposals

- to reinforce the water quality testing
- to establish the personnel and training functions.

In addition there will be other staff required to support and service these specific extras.

It is expected that the generally small numbers of extras required (both direct and indirect) can be regarded as coming within the underlying growth already discussed; however there is one exception, the required early large rise in meter readers for which special provision has been added.

(iii) The forecasting model

A computer model has been created which takes as its starting point a spreadsheet of DAWSSA's present staffing assembled according to the directorates; from this is projected forward the underlying growth, producing a separate view of staffing for every fifth year of the plan period, using the following assumptions:-

(a) that different rates of growth will apply to different groups of staff according to their roles; namely, that

- Top Managers will not change in numbers
- Professionals and Technical Controllers should increase to match the rate of increase in water connections (since they will be vital to the increasing dependence on high technology)
- there is scope for improved efficiency in the medium to longer term among Higher Administrative staff (e.g. reduced cashiers for a more cashless society), Skilled Workers (e.g. reduced plant operators due to SCADA and its extension in future), Lower Administrative staff (e.g. reduced clerks and typists from more office automation and data bases), and Unskilled Workers (e.g. reduced manual workers due to more mechanization, more productive drivers due to multi-skilling, reduced guards due to more automated security systems)
- Craft Workers should increase at a rate related to growth in the number of water connections (as they are currently at minimum levels)

and (b) that different rates of underlying growth will apply to different parts of the organization; namely that

- the directorates of Distribution, Consumer Service, Maintenance, and Accounting will grow at the highest rate related directly to the growth in the number of connections
- the directorates of Production and Standby Wells, Studies, Major Projects (including the existing Water Resources and Environmental), and Sewerage will grow at a lesser rate

- the remaining support directorates of Finance, Planning, Administration, General (including Internal Inspection, Water Quality, and Public Relations) will grow at the least rate of all.

Final adjustments have been made to the underlying growth figures projected by the model to allow for the inclusion of temporary and contract staff and the extra staff not accommodated by the increases allowed for by growth.

(iv) The manpower forecasts produced

The forecasts are summarized in Tables H-5.3 for each fifth year between 1996 and 2015, in the one case by directorate, and the other by job category (and more detail is given in Data Book 6e in the form of spreadsheets for each of the years considered).

The overall staffing increase derived by the modeling is from the present 1367 (including temporary and contract staff and 28 extra meter readers - see following) to 1566 in the year 2015; an increase of some 14.5%. (By comparison the increase would be 57%, to 2151, if a straight 2.47% growth was applied overall). In terms of the ratio 'staff per thousand connections' there is a decrease from 5.4 to about 4 reflecting the effects of the future efficiency assumptions. At present DAWSSA is turning increasingly to doing work by contract; and it may be that many aspects of its work allowed for in this manpower forecasting will be done by that means rather than by recruitment.

### 5.2.3 Specific Manpower Implications of the Master Plan

(1) Estimated staff required

Table H-5.2 sets out a summary schedule of estimated staffing likely to be needed to match the specific needs of the proposed Master Plan and it shows when they will be required. With one exception (meter readers), the numbers of staff required are covered by the overall increases indicated by the manpower forecasts; however, there is still a need to ensure that staff of the right caliber and skills are available as required.

This manpower is required for the following purposes:-

(i) Implementing the proposed investment programme

The proposed investment programme has been considered in order to assess its implications for DAWSSA engineers required to select, and to liaise with, consultants. Over the investment period to 2005, and assuming one engineer per informal area project and one per new water resources project but one for three of the mains renewal projects, then the totals



required are 9 to the year 2000 and 7 thereafter. There are currently 9 staff of the present Sewerage Directorate employed on ongoing 'informal area' projects which finish in 1997 so that they could supply the manpower and no extras would be required.

(ii) Reducing unaccounted-for-water (UFW)

It is of paramount importance to DAWSSA that UFW be reduced as quickly as possible; as explained elsewhere.. The renewal of water mains to be undertaken as capital investment projects plus the following approaches address this.

Meter repair and renewal - various options are being considered to replace the present arrangements for meter repair in future. In any case it seems likely that the work will be contracted out. Hence no effect on DAWSSA staffing has been included. A rate of 16,000 replacements per year is allowed up to 2002. Again this work seems certain to be undertaken by contract but there is a need for one extra staff person to accompany the contractors. This assessment is based on the experience of the current pilot contract for the replacement of 1,000 meters; there some 20 meters per day are being replaced with one DAWSSA staff member in attendance to update records, etc. On this basis the 16,000 pa programme at 53 replacements per day would imply the need for one extra member of DAWSSA staff.

Leakage detection and repair - currently there are three leakage teams operating, each with three members. The intention is to increase the number of teams to four in 1998 and five in 2006. Currently the teams are finding some 4 leaks per day (1200pa). The repair effort associated with this must be expected to be undertaken by the Emergency Department within the Distribution Directorate. There a staff of 110 undertake some 24 repairs per day (65 per man per year); on that basis an extra 6 staff would be required to match each extra leakage team added.

District meter areas - a programme is proposed over some 6 to 7 years starting in 1998 for the setting up of these areas. The establishment of these as discrete areas may involve the installation of boundary valves in some instances and for each a meter access chamber will be necessary. One 3 man gang within the Distribution directorate should be sufficient for his work together with a co-ordinating supervisor.

Pressure regulation - a feasibility study is proposed during 1998; subject to a successful outcome to this study then a programme of installation of valves in each of 68 areas would proceed from 1999 over 6 or 7 years. This work could probably be absorbed by the present Distribution directorate.

(iii) Improving meter reading, billing, and collection

Currently the Meter Readers of the Consumer Affairs directorate are taking from 3 to 6 months between readings; then it takes 3 months to produce a bill by computer in the Accounting directorate; and after this a further 2 months elapses back in Consumer Affairs directorate checking the bills before they are issued to the collection centers. Bills relate to quarters of the year and they are currently being produced covering two quarters at a time. The public is notified of which bills are available at the centers by way of advertisements placed in local newspapers. There is a period of at least one month's grace for the payment of bills before DAWSSA begins a follow up procedure.

It is of paramount importance to DAWSSA that the overall length of this process be shortened as explained elsewhere in this report. It is proposed initially therefore that in order to speed up this process (i) the meter reading cycle is reduced to 3 months. It is proposed that the improvement be achieved by the doubling of the basic staff by the urgent recruitment (or transfer) and training of an extra 28 Meter Readers (ii) the need to check bills be eliminated (and hence the 2 month delay) by the improvement of the receipt, vetting, and transmission of data on meter readings so that they can be sent for bill preparation with confidence. This will require initial assistance to the meter reading department to help them embrace new processes and equipment - this may require a consultancy project (iii) a return be made to issuing bills at quarterly intervals covering one quarter's water use (iv) the meter readers be required to deliver the bills to properties as part of their rounds of meter reading (an extra allowance of 10% staff be made to cover this i.e. a further 6 staff).

In the medium term it is proposed that all efforts be made to shorten the process further to 2 month reading and billing cycles. This would involve an assessment of the improved performance of meter reading and an improved computer system (a consultancy project ?).

(iv) Developing 'Information Technology'

Ideally some new and up-to-the-minute thinking needs bringing in here so that the recruitment of someone with outside experience is recommended to oversee a review of strategy, staffing, training, and equipment. It is difficult to foresee the exact outcome of such a radical review in staffing terms but for the moment it is believed that staffing numbers need not exceed the combined staffs of the present technical (12) and financial (8) computing functions plus the SCADA team(10).

(v) Reinforcing water quality testing

Currently the water quality control department consists of two sections; for laboratory and for disinfection. It is proposed elsewhere that the disinfection should be returned to its obvious place as part of the Production directorate but that, in order to ensure impartiality, the analysis section should remain independent. To match the proposed reinforcement of this service a doubling of the analysis staff (to 20) is proposed by the year 2015 together with comprehensive training.

Administration and data processing staff are to be enhanced by 2; three extra graduates are required for routine analysis; and three highly qualified specialists (masters degree) are required for trace element analysis and micro biological analysis; plus 2 extra drivers. All 5 drivers would be trained to perform simple routine analyses on site.

(vi) Establishing the personnel and training functions

Ideally in order to give these functions the prominence they deserve a separate directorate for Human Resources would be recommended. It is recognized, however, that the organization may not, in the short term, be ready for such a move, and so the suggestion is ;

- the creation of a new Personnel Department within the Administration Directorate; this should not initially require any extra staff .
- a reinforcement of the Training function by the creation of a new Training Department within the Administration directorate. A new head of department and a minimum of two further full-time trainers and two instructors (part-time?) would need to be found (from within or outside) to implement the approach already proposed.

(2) Special requirements for education and training

In addition to the general recommendations on improving training throughout DAWSSA the following specific requirements arise from the preparation of the Master Plan.

(i) Water resources

Within the existing Water Resources Directorate there are no staff except the director with specialist qualifications in essential water resources related subjects. The directorate should include specialists with the minimum of a university degree in the following; hydrology, hydrogeology, hydrochemistry, geology, groundwater modeling. These deficiencies could be remedied in a number of ways; by recruitment, on-the-job training, sponsorship for further training or education, or secondment of specialists from other government agencies.

(ii) Water quality analysis

It is proposed that the staff involved in water testing should be doubled over the next 20 years and these staff have need of very specialized skills. Obviously the existing staff have the necessary general knowledge in chemistry and biology to undertake the current routine physical, chemical, and biological analyses, but the DAWSSA laboratory will be unable to implement the more sophisticated analysis (for pesticides, specialized biological analysis, etc.) which will be required over the next 20 years, unless DAWSSA takes the initiative in training its staff. DAWSSA is urged to launch a series of training programmes for the laboratory staff as suggested in Table H-5.4.

*TABLES*

**Table II-2.1 Organization Structure of the Public Administration in the Syrian Republic**

According to the Constitution of 1973 , the authorities in the Syrian Arab Republic are distributed among;

Legislative Body - The Peoples Assembly  
Juridical Body - Courts , General Attorney , Supreme Court .  
Executive Body - The Cabinet

### CONTENTS

- 1 The Peoples Assembly
- 2 The Juridical Body
  - 2.1 Supreme Constitutional Court
  - 2.2 State Council
- 3 The Prime Ministry
- 4 Offices associated with The Prime Ministry
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  - 4.2 Office of Supreme Council for Public Construction Companies
- 5 Commission , Organization & Councils
  - 5.1 Central Commission for control & Inspection
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  - 5.3 Central Bureau for Statistics
  - 5.4 State Planning Commission
- 6 Ministries
  - 6.1 Ministry of Economy & Foreign Trade
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  - 6.4 Ministry of Finance
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  - 6.7 Ministry of Information
  - 6.8 Ministry of Social Affairs & Labor
  - 6.9 Ministry of Industry
  - 6.10 Ministry of Education
  - 6.11 Ministry of Higher Education
  - 6.12 Ministry of Culture
  - 6.13 Ministry of Foreign Affairs
  - 6.14 Ministry of Local Administration
  - 6.15 Ministry of Housing & Public Utilities
  - 6.16 Ministry of Awkaf ( Religious Affairs )
  - 6.17 Ministry of Interior
  - 6.18 Ministry of Tourism
  - 6.19 Ministry of Health
  - 6.20 Ministry of Communication
  - 6.21 Ministry of Transport
  - 6.22 Ministry of Irrigation

Table II-2.2 Review of Status & Statutory Instruments Relevant to DAWSSA

ITEM	REFERENCE	DATE	SUMMARISED TITLE
	According to the 1973 Constitution		Organisation Structure of Public Administration in the Syrian Arab Republic
1.	Decree #2273	20 Nov. 1967	Regulations of Exploitation for Public Water Establishments
2.	Decision #475	20 Feb. 1968	Regulations of Exploitation for Figh Water (applying Decree #2273)
3.	Decree #18	15 Feb. 1974	Law for Public Establishments, Companies, & Enterprises
4.	Decree #252	14 May 1975	Creating a Water Supply Establishment for Damascus (applying Decree #18)
5.	Decree #14	1 Oct. 1984	Creating an Establishment for Water Supply & Sewerage in each Governorate in Syria
6.	Decree 1/1985	2 Jan. 1985	Basic Law for State Employees
7.	Decision #475 (Consolidated)	Updated to 31 Dec. 1986	Regulations of Exploitation for Public Water Establishments (for DAWSSA) -- Consolidated
8.	Law #10	30 Mar. 1989	Creating Protection Zones around Figh Spring
9.	Instruction #7642/2/1 from the Minister of Housing	1 Aug. 1992	Requiring a review of the structure & staffing of DAWSSA in accordance with a model provided & a review of machinery & transport (following the PM letter #2039 of 4 July 1992)
10.	Resolution #1988	21 Aug. 1993	Amendments to Decree #2273 -- Regulations of Exploitation for Public Water Establishments
11.	Decree #20	18 Sept. 1994	Law for Public Establishments, Companies, & Enterprises (supersedes Decree #18)
12.	Decision #58	2 Jan. 1994	Revising standard water tariffs for all Syria
13.	Decree #381	20 Dec. 1995	Setting up a DAWSSA Sewerage Company (applying Decrees #14 & 20)
14.	Decree #1	3 Jan. 1996	Revising the Terms of Employment of Graduate Engineers





Table H-3.1 DAWSSA Directorates by Revised Job Categories 1995/6

1995-6	DAWSSA DIRECTORATES											Totals		
	Total Production	Standby	Distribution	Consumer	Maintenance	Accounting	Finance	Studies	Main Proj.	Sewerage	Planning		Admin'n	General
<b>Managers</b>	70	6	4	7	6	4	3	5	6	10	4	5	5	70
- Directors	0	1	1	1	1	1	1	1	1	3	1	1	3	18
- Department Heads	5	5	6	5	3	2	4	5	7	7	3	4	2	52
- Other Heads (199 incl. below)														
<b>Professionals</b>	221	39	1	26	11	15	10	22	42	34	8	3	4	221
- Graduates	0	27	1	15	0	12	4	9	37	24	6	2	0	142
- Higher Technicians	12	0	0	11	11	3	6	13	5	10	2	1	4	79
<b>Technical Controllers</b> (plus Other Seniors)	131	0	27	11	28	19	7	4	14	7	8	0	1	131
- (plus Other Seniors)	0	27	11	28	19	7	4	4	5	7	8	0	1	131
<b>Higher Administrative</b> (Clerks)	128	0	6	25	53	4	7	12	7	4	0	0	4	128
- Inspectors	0	5	6	25	16	4	0	1	7	2	0	0	0	66
- Cashiers	0	0	0	0	29	0	0	9	0	0	0	0	0	38
- Auditors	0	0	0	0	7	0	0	1	0	0	0	0	0	8
- Timekeepers	0	0	0	0	0	0	0	0	0	0	0	4	0	4
- Translators	1	0	0	0	1	0	0	0	0	2	0	0	0	4
- Computer Operator	0	0	0	0	0	0	7	1	0	0	0	0	0	8
<b>Skilled Water Workers</b> (Professional Workers)	208	0	79	29	13	77	5	0	3	0	0	0	0	208
- Draftsmen	0	0	0	1	0	0	0	0	1	0	0	0	0	2
- Technicians	0	2	6	0	6	0	0	0	2	0	0	0	1	17
- Plant Operators	79	0	27	0	0	2	0	1	0	0	0	0	0	109
- Meter Readers	0	0	0	0	33	0	0	0	0	0	0	0	0	33
- Meter Installers	0	0	0	2	34	0	0	0	0	0	0	0	0	36
- Plumbers	0	0	0	4	4	3	0	0	0	0	0	0	0	11
<b>Craft Workers</b>	32	0	5	0	0	23	0	0	0	0	0	0	1	32
- Electricians	1	0	0	0	0	3	0	0	0	0	0	0	0	4
- Mechanics	4	0	0	0	0	4	0	0	0	0	0	0	0	8
- Smiths	0	0	0	0	3	0	0	0	0	0	0	0	0	3
- Painters	0	0	0	0	0	3	0	0	0	0	0	0	0	3
- Carpenters	0	0	0	0	0	1	0	0	0	0	0	0	0	1
- Agricultural	0	0	0	0	0	12	0	0	0	0	0	1	0	13
<b>Lower Administrative</b>	132	0	0	1	39	3	2	23	5	4	0	0	49	132
- Clerks	0	0	0	0	39	3	2	23	5	4	0	0	30	111
- Typists	0	0	0	1	0	0	0	0	0	0	0	0	17	19
- Phone Operators	0	0	0	0	0	0	0	0	0	0	0	2	0	2
<b>Unskilled Workers</b> (Ordinary Workers)	417	0	26	22	85	45	115	0	12	1	0	0	94	417
- Manual Labourers	25	21	83	39	0	41	0	15	10	1	0	0	0	237
- Attendants	0	1	1	0	0	0	0	0	2	0	0	17	0	20
- Drivers	1	1	1	0	74	0	0	0	0	0	0	2	0	78
- Guards	0	0	0	0	0	0	0	0	0	0	0	73	0	73
- Messengers	0	0	0	6	253	0	26	0	83	0	0	2	0	288
<b>TOTALS</b>	1339	188	73	185	253	176	26	83	89	60	20	8	158	1339

**Table H-4.1 The 'French Report' - Title Page & List of Volumes**

**A STUDY**  
**ON**  
**"IMPROVING THE MANAGEMENT OF THE ESTABLISHMENT"**  
**FOR**  
**L'E.P.E.F**  
**(The Public Establishment of the Waters of Damascus)**  
**BY**  
**SEMA(Metra International) / SLEE(Societe Lyonnaise des Eau)**  
**IN**  
**1976 / 1977**

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**List of Volumes**

**Volume 1** Report of the Diagnostic Analysis.

**Preliminary Plan: -**

**Volume 2** Evolution of Water Consumption & Consequences for Financial Management.

**Volume 3** Structures.

**Volume 4** Procedures.

**Volume 5** The Pilot Programme for Detailed Studies & Implications.

## Table II-4.2 Main Conclusions of the Study

TRANSLATED FROM THE "FRENCH REPORT" - 1976 / 1977

"IMPROVING THE MANAGEMENT OF THE ESTABLISHMENT"

VOLUME 5 THE PILOT PROGRAM FOR DETAILED STUDIES & IMPLEMENTATION

CHAPTER 1 (p. 5 & 6)

The Preliminary plan has foreseen the restructuring of the Directorates and the creation, or the reorganization of numerous Services. Here is a brief recap of the list.

### 11. The New Projects Directorate

For the medium term we have foreseen the replacement of the Directorate of New Projects by a Directorate of Studies and New Works that will comprise 2 departments;

- \* Studies
- \* Works

### 12. The Technical Directorate

The Technical Directorate becomes a Directorate of Exploitation comprising 4 services;

- \* Production
- \* Distribution
- \* Standby projects
- \* Logistic

The first three are partly restructured out of the currently existing departments; the latter in charge of supplies and vehicles & mobile plant - notably supplies which stands as a genuine creation - could be organized very quickly.

### 13. The Subscribers Affairs Directorate

This directorate that comprises 4 departments;

- \* Exploitation centers (12 in principles)
- \* Subscribers
- \* Connections of piping, meters
- \* Billing and collection

is an important creation. It takes care of relations with the clients, the income and the image of the EPEF will depend on this directorate.

### 14. The Administrative Directorate

The various sections of this directorate will be restructured into a department of general means, with emphasis on the importance of the creation of a Personnel Department.

### 15. The Financial Directorate

This directorate will not attend to anything that is not a strictly financial matter. It will be reduced to 3 departments;

- \* Accounts
- \* Treasury
- \* Management Accounting & Budget.

The restructuring in this directorate calls for rationalization; the third department will be structured in conjunction with the Administrative Control department.

### 16. The Planning and Economic Studies Directorate

This directorate will have its tasks expanded.

### 17. The Department of Organization and Informatics

This department should be entirely created. It will be entrusted, in connection with the consultants engineers, with the charge of the implementation of the organization studies and the gradual conversion to informatics - first the accounting, then the administration.

### 18. The Department of Administration Control

This department is to be created to work on the documents furnished by the accounting of the administration.

### 19. The Department of Public Relations

**Table H-5.1 (1/2) DAWSSA Organization Development**

<b>The PRESENT STATE</b>	<b>The DESIRED STATE (Best Modern Practice)</b>
<b>Institutional</b>	
Uncertainty on water resources planning	Clear national roles & responsibilities - more certain water resources planning
<b>The DAWSSA Institution</b> Extensive Government controls on financial, economic, personnel & management matters	More autonomy for DAWSSA - authority with responsibility
<b>DAWSSA Board</b>	
Limited scope & authority	Representative of the full breadth of City interests in water matters with the autonomy to provide strategic direction & control
<b>DAWSSA Organisation</b>	
<b>(i) Culture</b>	
Technically oriented	Customer service orientation
Bureaucratic	Managers empowered to take decisions at appropriate levels; minimised paperwork & checking, shared data bases
Paternalistic	
Public service ethos	Motivated staff striving for excellent service to customers
<b>(ii) Structure</b>	
Many directorates & layers of management	Compact organisation structure avoiding duplication & focusing on "source to tap service"
No clearly defined focus for matters of personnel, training, & information technology	Co-ordinated management for Human Resources Development (personnel, training, etc) & Information Technology (computing, SCADA, information systems, etc)

**Table H-5.1 (2/2) DAWSSA Organization Development**

The PRESENT STATE	The DESIRED STATE (Best Modern Practice)
<b>Management</b>	
<p>"Technical Officers" with some added responsibilities;</p> <p>reluctant to make decisions;</p> <p>limited performance assessment;</p> <p>little management information;</p> <p>disciplinary ethos;</p> <p>little staff development &amp; poor safety record;</p> <p>little strategic thinking</p>	<p>Rounded "managers" appropriately authorised to plan, organise &amp; control;</p> <p>responsible for staff, budgets, &amp; performance;</p> <p>well supplied with Management Information;</p> <p>accountable for their performance</p>
<b>Manpower Motivation</b>	
<p>Low basic pay</p> <p>Complete job security</p> <p>Little performance appraisal</p> <p>Little incentive to seek promotion to more responsible jobs</p>	<p>Adequate pay &amp; conditions to avoid demotivation</p> <p>Motivation through management ethos of encouragement, delegation, involvement, team building, &amp; individual development for staff</p> <p>Able to attract &amp; retain good quality recruits</p>
<b>Equipment</b>	
<p>Only the most basic vehicles, plant, communications, etc</p>	<p>Ensure best productivity (labour saving, efficiency, &amp; best performance) by supporting all staff &amp; workers with the most up-to-date equipment possible</p>

Table H-5.2 DAWSSA Staff Required as a Direct Result of the Master Plan Proposals

Directorate	Planned Item	Job	Quals	Present	1996	1997	1998	1999	2000	2005	2010	2015
<i>Distribution</i>	Leakage Detection Teams (Note - 3 teams exist)	Supervisor	Technician	3			1			1		
		Inspector	Secondary	3			1			1		
		Labourer	Elementary	3			1			1		
	Leak Repairs	Labourer	Elementary	90			6			6		
	DMA Meter Chambers	Labourer	Elementary	14				3				
<i>Consumer</i>	Meter Renewal Records	Inspector	Secondary	25	1	1						
	Meter Reading	Meter Readers	Secondary	33	28							
<i>Studies &amp; Constr.</i>	Informal Areas - (Sewerage Directorate)	Engineers	Graduates									
		Asst.Eng.	Higher Tech.	9		3						
		Engineers	Graduates									
	Mains Renewal - (Distribution Directorate)	Asst.Eng.	Higher Tech.	22		3						
		Engineers	Graduates									
	Water Resource Devel. - (Studies Directorate)	Asst.Eng.	Higher Tech.	100		3						
<i>Information Technology</i>	Proposed Directorate	Director?	Graduate +	0	1							
	Proposed Department of Personnel	Head of Dept.?	Graduate	0		1						
<i>Administration</i>	Proposed Training Dept.	Head of Dept.?	Graduate	0	1							
		Trainers	Graduate	0	0	1						
		Instructors (part-time?)	Grad/Teach	0		2						
			Secondary	0		2						
<i>Water Analysis</i>	Proposed W.Q. Dept	Head of Dept.?	Graduate	0		1						
		Data Process/Analyst	Graduate	1		1						
		Normal Analysts	Graduate	5		1				2		
		Specialist Analysts	Masters	1		1				2		
		Driver / Testers	Secondary	3		1				1		

**Table H-5.3 (1/2) Manpower Forecast for DAWSSA  
- by Directorates 1995/6 - 2015**

	1995/6	2000	2005	2010	2015	+%
b Production	188	199	200	201	202	7
b Standby	73	77	76	75	73	0
a Distribution	185	208	219	232	245	33
a Consumer	281	317	328	340	353	26
a Maintenance	176	198	208	219	231	31
a Accounting	26	29	31	34	37	41
c Finance	83	85	83	80	78	-6
b Studies	89	91	90	90	89	-0
b Main Projects (incl. WR & Env.)	60	63	66	68	71	18
b Sewerage	20	21	22	23	24	22
c Planning	8	8	8	8	8	5
c Administration	158	163	153	144	135	-15
c General (incl. WQ, II, & PR)	20	20	20	20	19	-4
Totals	1367	1481	1504	1533	1566	15

Notes:

1. Temporary & contract staff plus extra meter readers included

2. Annual Growth factors  
Factors 'g'

2.47 % = a  
1.23 % = b  
0.61 % = c

3. Annual Efficiency  
Improvement 'e'

2.00 %

**Table H-5.3 (2/2) Manpower Forecast for DAWSSA  
- by Job Categories 1995/6 - 2015**

	1995/6	2000	2005	2010	2015	+%
0 <b>Managers</b> (Directors & Dept. Heads)	70	70	70	70	70	0
g <b>Professionals</b> (Graduates & Higher Techn.)	221	236	252	269	289	31
g <b>Technical Controllers</b> (plus Other Seniors)	131	142	154	168	183	40
g-e <b>Higher Administrative</b> (“Clerks”)	128	141	142	142	143	12
g-e <b>Skilled Water Workers</b> (“Professional Workers”)	236	259	258	257	256	8
g <b>Craft Workers</b> (Carpenters, Painters, etc)	32	36	40	45	50	57
g-e <b>Lower Administrative</b> (Clerks, Typists, etc)	132	141	136	132	128	-3
g-e <b>Unskilled Workers</b> (“Ordinary Workers” – Manuals, Drivers, Guards, etc)	417	456	452	450	447	7
<b>Totals</b>	<b>1367</b>	<b>1481</b>	<b>1504</b>	<b>1533</b>	<b>1566</b>	<b>15</b>

Notes:

1. Temporary & contract staff plus extra meter readers included

2. Annual Growth  
Factors 'g'  
2.47 %  
1.23 %  
0.61 %

3. Annual Efficiency  
Improvement 'e'  
2.00 %



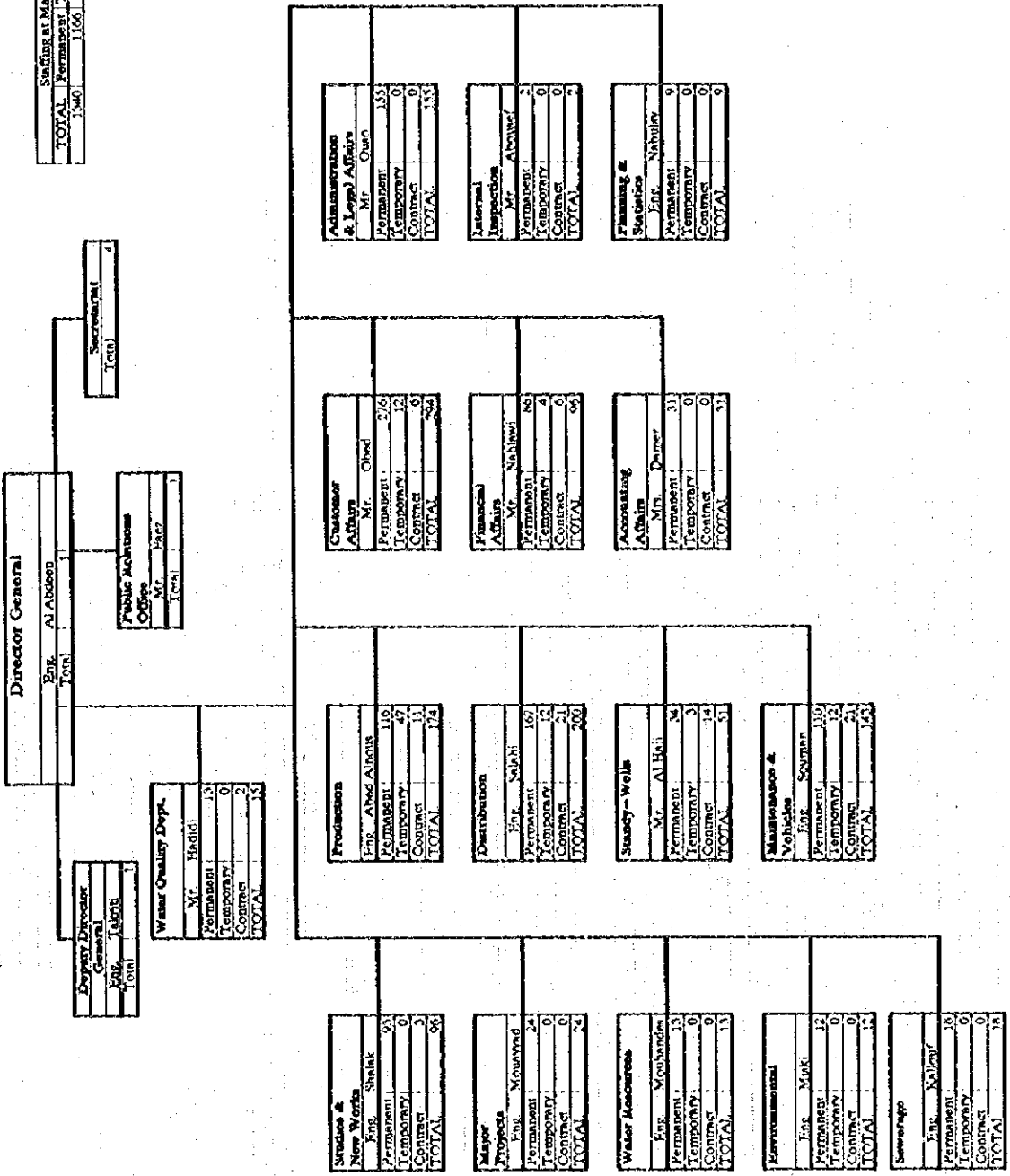
**Table II-5.4 Recommended Special Training for Water Quality Analysis**

Program Name	Suggested Program	target year
Pesticide Extraction	Learn solid and liquid-liquid extraction method at HIAST	1997
GC-MS analysis	Take a series of training course (1 month) at DAWSSA from an invited technician from Varian using the existing system. Analyze real water samples.	1997
Virus and Pathogen analysis	Visit a water testing laboratory and take a series of training course (1 month).	1998
Automated Ion Analysis with Ion Chromatography	Take a series of intensive training course (3 weeks) at a manufacturer.	1999
Computer	Mandatory short program on word-processing and spreadsheet	1997 - 2015

*FIGURES*



Staffing at March 1996			
TOTAL	Permanent	Temporary	Contract
1,340	1,066	90	84

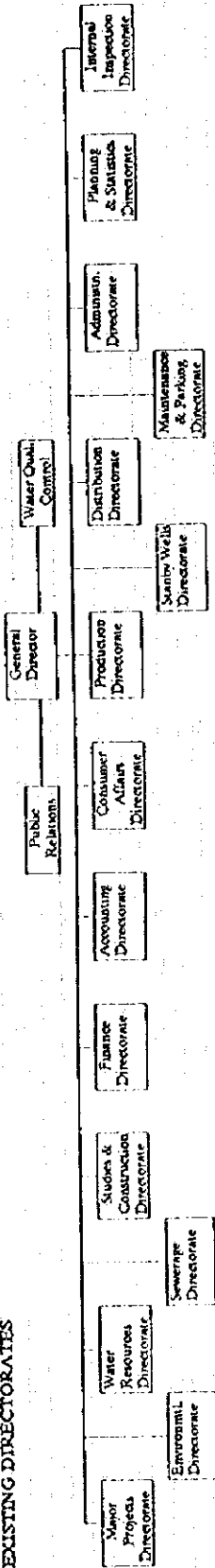


JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
 THE STUDY ON THE DEVELOPMENT OF  
 WATER SUPPLY SYSTEM FOR THE DAMASCUS CITY  
 Figure H-3.1  
 DAWSSA Organization Structure  
 NIPPON KOEI CO., LTD.

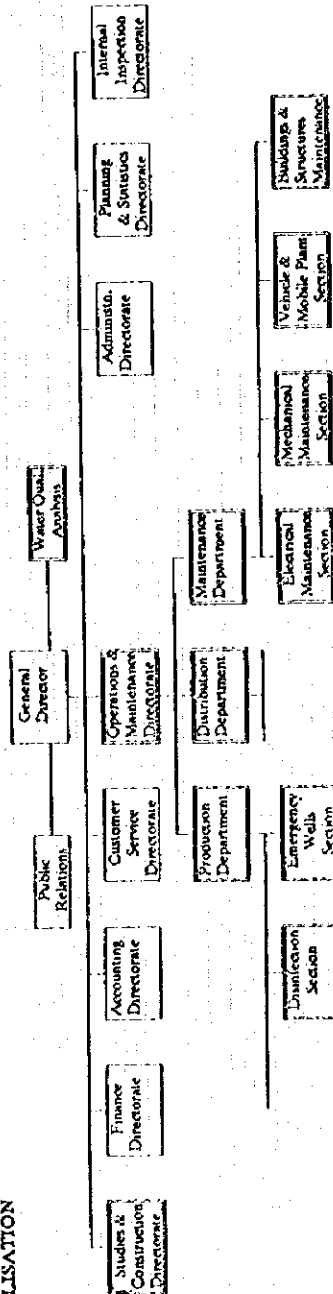
# PROPOSED PROGRESSIVE CHANGES TO THE DAWSSA ORGANIZATION STRUCTURE

Notes: (i) the entire number of Directorates is shown in each case; for Departments & Sections below that level only changes are shown.  
 (ii) changes are indicated by double lines around boxes.

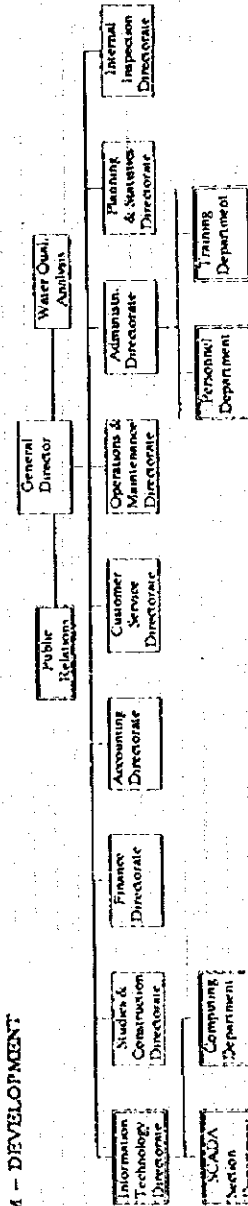
## EXISTING DIRECTORATES



## MEDIUM TERM - RATIONALISATION



## MEDIUM TERM - DEVELOPMENT



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
 THE STUDY ON THE DEVELOPMENT OF  
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 Figure H-5.1  
 Proposed Changes to DAWSSA Organization  
 NIPPON KOEI CO., LTD.