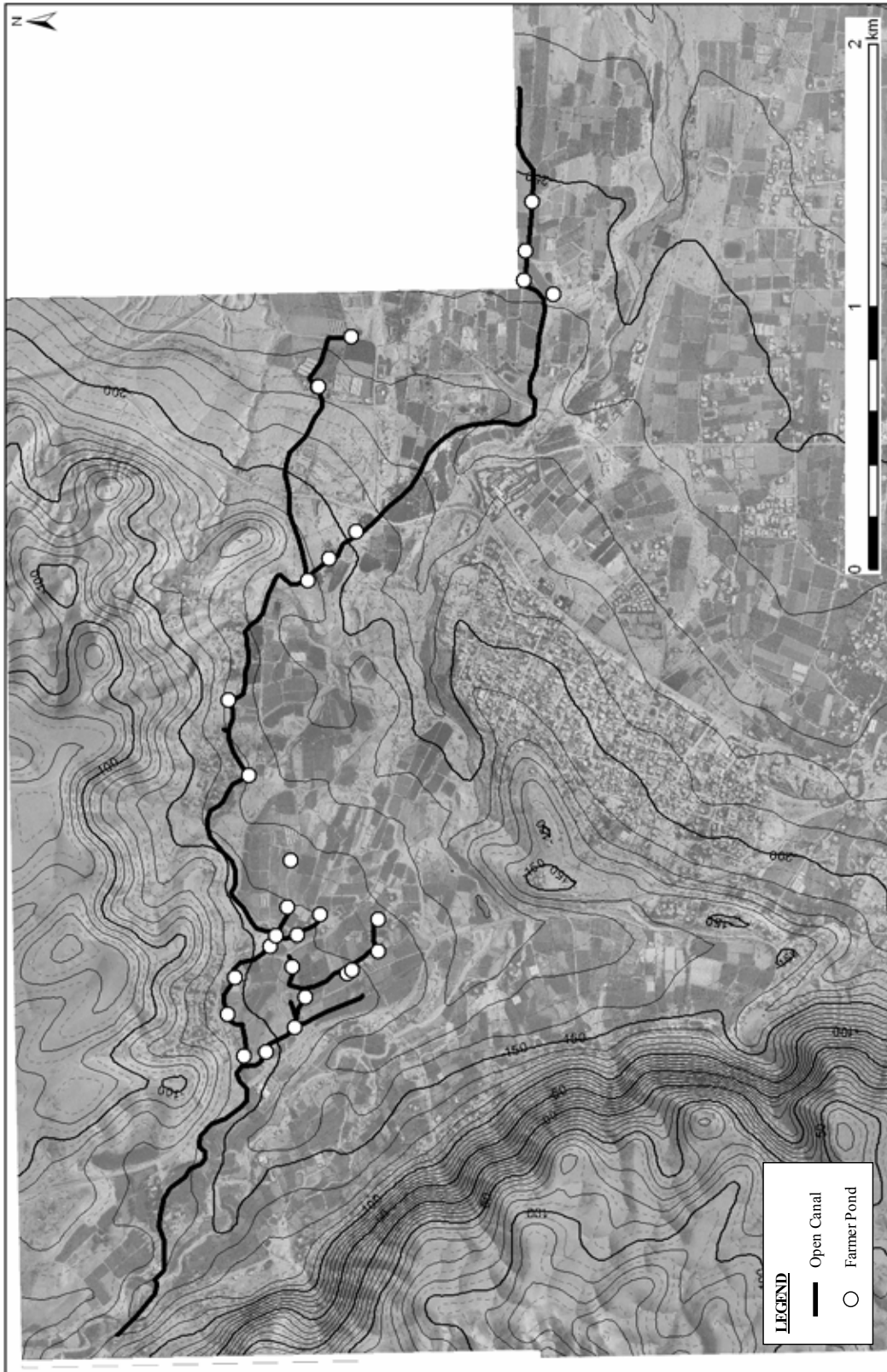
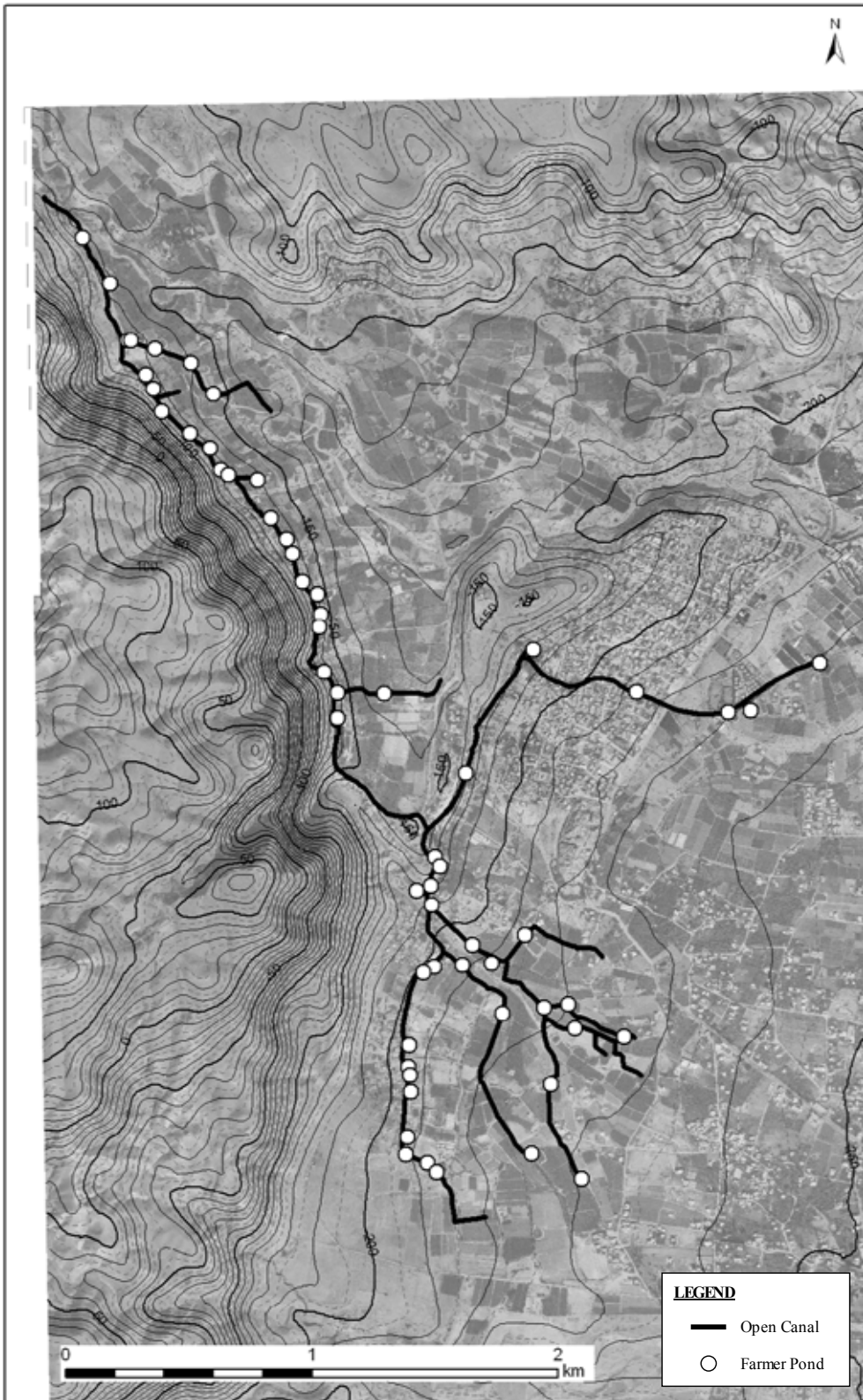


Annex 4.2

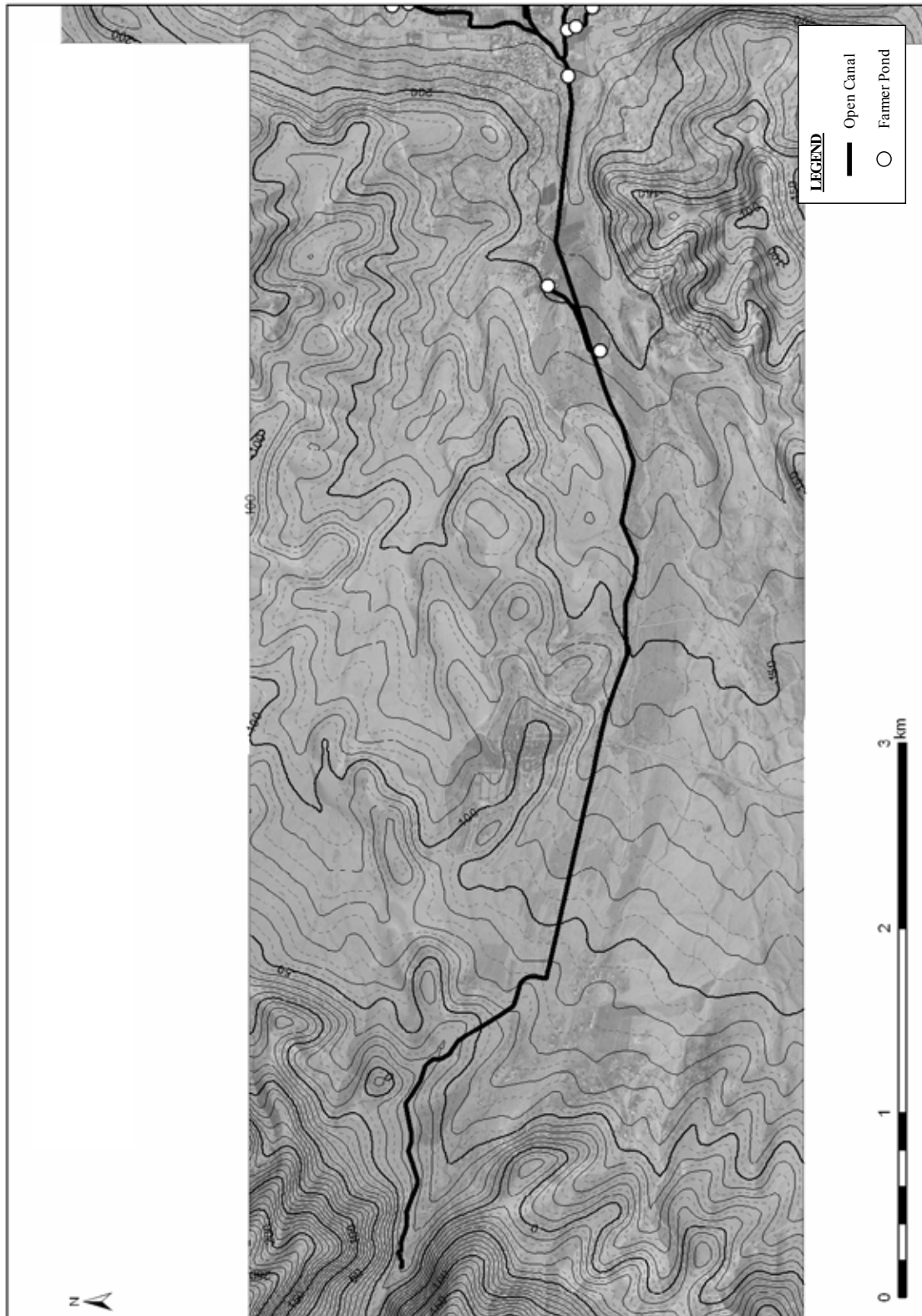
*Spring Water Conveyance Layouts in
Priority Sites*



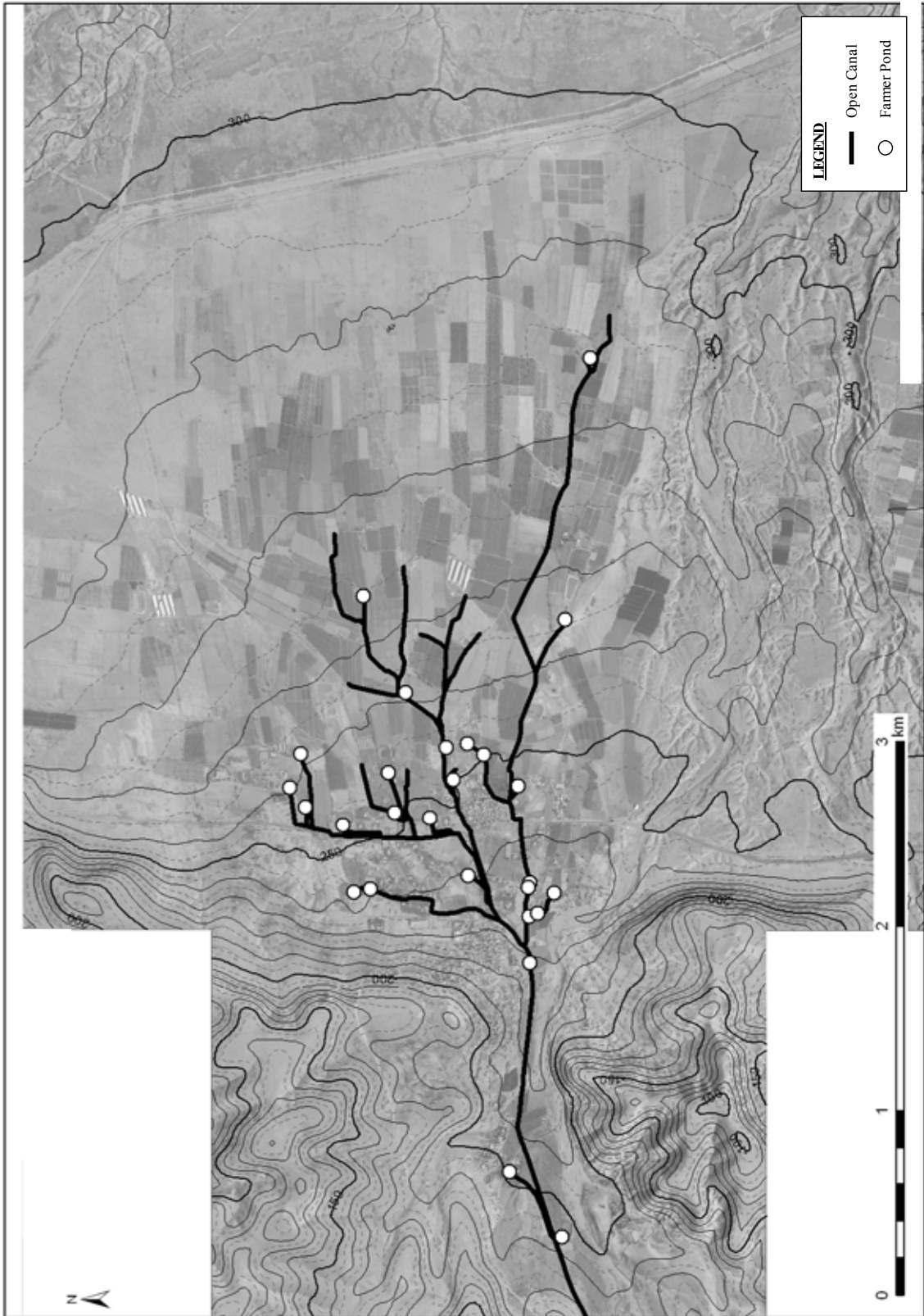
Existing Layout of Al Nwai'mah Spring Water Conveyance System



Existing Layout of Al Dyuk Spring Water Conveyance System



Existing Layout of Al 'Auja Spring Water Conveyance System (Upper)

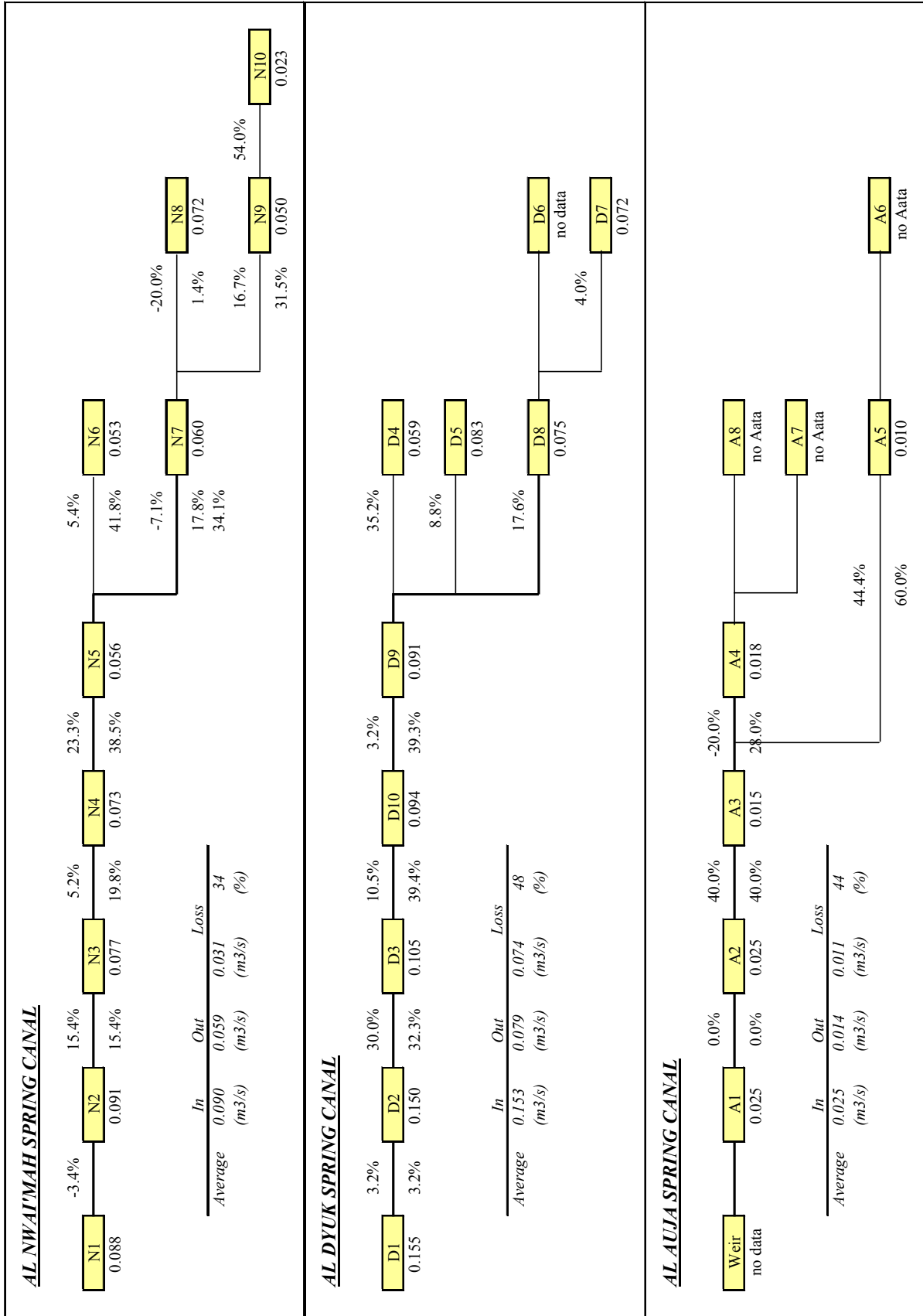


Existing Layout of Al 'Auja Spring Water Conveyance System (Lower)

Annex 4.3

Spring Water Losses in Priority Sites

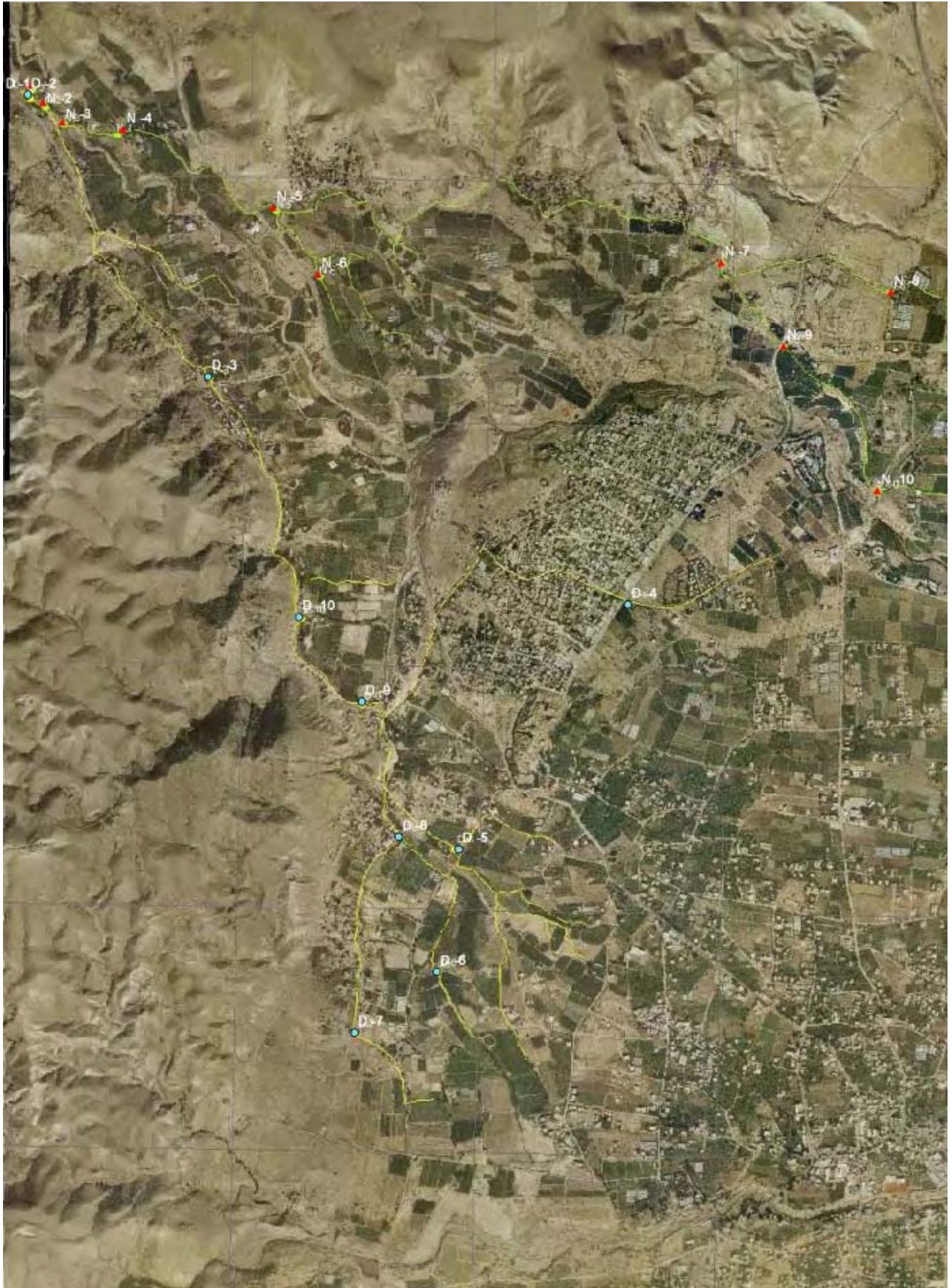
Estimated Water Loss in Existing Open Canal



Result of Site Survey for Water Flow Measurement

Measurement Points	Coordinates (East)	Coordinates (North)	Total channel width (W) (cm)	Total depth of Water (H) (cm)	Pulses (rev.)	Time (sec)	n (rev/sec)	Velocity (V) (m/sec) Calculated	Wet sectional Area (A) (m ²)	sectional Q (m ³ /sec)	Total Q (m ³ /sec)	Remarks
1 Nwe meh Spring												
1.1 N 1	001-90-138	011-44-724	58.0	24 - 27								
Section 1			19.3	24	102	50	2.04	0.552	0.046	0.026		
Section 2			19.3	27	105	50	2.10	0.568	0.052	0.030	0.088	
Section 3			19.3	27	115	50	2.30	0.621	0.052	0.032		
1.2 N 2	001-90-195	011-44-651	55.0	28 - 30								
Section 1			18.3	30	102	50	2.04	0.552	0.055	0.030		
Section 2			18.3	28	110	50	2.20	0.595	0.051	0.031	0.091	1. there is a P.E pipe in the canal section.
Section 3			18.3	28	107	50	2.14	0.579	0.051	0.030		
1.3 N 3	001-90-276	011-44-570	60.0	18 - 23								
Section 1			20.0	23	69	50	1.38	0.376	0.046	0.017		
Section 2			20.0	22.5	140	50	2.80	0.755	0.045	0.034	0.077	
Section 3			20.0	19	125	50	2.50	0.675	0.038	0.026		
1.4 N 4	001-90-524	011-44-540	51.0	28 - 30								
Section 1			17.0	29	105	50	2.10	0.568	0.049	0.028	0.073	
Section 2			17.0	30	94	50	1.88	0.509	0.051	0.026		
Section 3			17.0	28	74	50	1.48	0.403	0.048	0.019		
1.5 N 5	001-91-143	011-44-218	55.0	25 - 27								
Section 1			18.3	25	71	50	1.42	0.387	0.046	0.018		
Section 2			18.3	27	85	50	1.70	0.461	0.049	0.023	0.056	
Section 3			18.3	27	59	50	1.18	0.323	0.049	0.016		
1.6 N 6	001-91-327	011-43-945	45.0	15								
Section 1			15.0	15	168	50	3.36	0.904	0.023	0.020		
Section 2			15.0	15	141	50	2.82	0.760	0.023	0.017	0.053	
Section 3			15.0	15	124	50	2.48	0.669	0.023	0.015		
1.7 N 7	001-92-982	011-43-994	40.0	18								
Section 1			13.3	18	168	50	3.36	0.904	0.024	0.022	0.060	
Section 2			13.3	18	158	50	3.16	0.851	0.024	0.020		
Section 3			13.3	18	137	50	2.74	0.739	0.024	0.018		
1.8 N 8 (small current meter)	001-93-679	011-43-872	51.0									
Section 1			17.0	6	317	50	6.34	2.121	0.010	0.022		The water is shallow (less than 6cm), the current meter used is not accurate for such depth
Section 2			17.0	6	348	50	6.96	2.327	0.010	0.024	0.072	
Section 3			17.0	6	395	50	7.90	2.640	0.010	0.027		
1.9 N 9 (small current meter)	001-93-239	011-43-650	38.0	10								
Section 1			12.7	10	192	50	3.84	1.288	0.013	0.016	0.050	
Section 2			12.7	10	203	50	4.06	1.361	0.013	0.017		
Section 3			12.7	10	192	50	3.84	1.288	0.013	0.016		
1.1 N 10	001-93-625	011-43-056	13.0	28								
Section 1			4.3	28	107	50	2.14	0.579	0.012	0.007		
Section 2			4.3	28	122	50	2.44	0.659	0.012	0.008	0.023	
Section 3			4.3	28	116	50	2.32	0.627	0.012	0.008		

Measurement Points	Coordinates (East)	Coordinates (North)	Total channel width (W) (cm)	Total depth of Water (H) (cm)	Pulses (rev.)	Time (sec)	n (rev/sec)	Velocity (V) (m/sec) Calculated	Wet sectional Area (A) (m ²)	sectional Q (m ³ /sec)	Total Q (m ³ /sec)	Remarks
3 Auja Spring												
3.1 A 1 (BFM001 Cr. Meter)	001-89-004	011-50-430	116 / 68	26								
Section 1 (Trapezoidal sec)			41 / 17	26	5	50	0.10	0.038	0.075	0.003		
Section 2			17.0	26	15	50	0.30	0.088	0.044	0.004	0.025	
Section 3			17.0	26	26	50	0.52	0.147	0.044	0.006		
Section 4 (Trapezoidal sec)			41 / 17	26	28	50	0.56	0.157	0.075	0.012		
3.2 A 2	001-90-279	011-50-140	100 / 68	18								
Section 1 (Trapezoidal sec)			32 / 16	18	33	50	0.66	0.184	0.043	0.008		
Section 2			16.0	18	31	50	0.62	0.173	0.029	0.005	0.025	
Section 3			16.0	18	31	50	0.62	0.173	0.029	0.005		
Section 4 (Trapezoidal sec)			32 / 16	18	27	50	0.54	0.152	0.043	0.007		
3.3 A 3	001-92-366	011-50-171	80.0	18								
Section 1			20.0	18	13	50	0.26	0.077	0.036	0.003		
Section 2			20.0	18	15	50	0.30	0.088	0.036	0.003	0.015	
Section 3			20.0	18	22	50	0.44	0.125	0.036	0.005		
Section 4			20.0	18	22	50	0.44	0.125	0.036	0.005		
3.4 A 4	001-94-058	011-50-434	80 / 51	22								
Section 1			23 / 17	22	17	50	0.34	0.099	0.044	0.004		
Section 2			17.0	22	26	50	0.52	0.147	0.037	0.005	0.018	
Section 3			23 / 17	22	33	50	0.66	0.184	0.044	0.008		
3.5 A 5	001-93-968	011-50-309	88 / 53	18								
Section 1			88 / 53	18	13	50	0.26	0.078	0.127	0.010	0.010	one point only taken because the impeller moved only in one point, the velocity is very low
3.6 A 6	001-94-728	011-50-430										
Section 1												There is no water
Section 2												
Section 3												
3.7 A 7	001-94-569	011-50-747										
Section 1												There is no water
Section 2												
Section 3												
3.8 A 8	001-94-142	011-50-753										
Section 1												There is no water
Section 2												
Section 3												



Water Flow Measuring Point – Al Dyuk and Nwai'mah Spring



Water Flow Measuring Point – Al ‘Auja Spring

Annex 4.4

Spring Water Right in Priority Sites

WATER RIGHT - NWAH'MAH

No	Farmer Name	Water Right		Total Hours	m3/yr	Weight
		Minutes	Hours			
1	Awni Aldajani	55	601	601.92	1,185,292	45.6%
2	Abdellah Alfhoud	40	26	26.67	52,512	2.0%
3	Mohammad Nu'iraat	30	18	18.50	36,430	1.4%
4	Husain Salama	7	37	37.12	73,090	2.8%
5	Alkhouri Flubs	0	13	13.00	25,600	1.0%
6	Alhaj Jbreen	0	2	2.00	3,938	0.2%
7	Ibraheem Rashid	12	20	20.20	39,778	1.5%
8	Abdullah Masa'eed	45	15	15.75	31,015	1.2%
9	Alhusaini	10	165	165.17	325,246	12.5%
10	Abdelhafez Sons	35	10	10.58	20,841	0.8%
11	Obeed Allah Albrashi	30	14	14.50	28,553	1.1%
12	Ali Alsalem	15	49	49.25	96,983	3.7%
13	Ied Balou	0	1	1.00	1,969	0.1%
14	Salem Ameera	0	5	5.00	9,846	0.4%
15	Ied Elqiash	37	4	4.62	9,091	0.3%
16	Yousif Jabareen	30	27	27.50	54,153	2.1%
17	Ali Abdellhadi	0	5	5.00	9,846	0.4%
18	Ibraheem Mahmoud	0	6	6.00	11,815	0.5%
19	Safya Bkhetan	22	4	4.37	8,599	0.3%
20	Saleh Alawad	0	12	12.00	23,630	0.9%
21	Saleh Sulieman Mahmoud	0	5	5.00	9,846	0.4%
22	Saleh Habas	40	4	4.67	9,190	0.4%
23	Daoud Aldajani Sons	45	17	17.75	34,953	1.3%
24	Mohammad Saeed	15	4	4.25	8,369	0.3%
25	Shehadah Hamdan	30	6	6.50	12,800	0.5%
26	Shehadah Elsaalem Ahmad	30	30	30.50	60,060	2.3%
27	Saeed aldajani	10	10	10.17	20,020	0.8%
28	Abdelsalem Ied	0	15	15.00	29,538	1.1%
29	Hasan Balou sons	40	4	4.67	9,190	0.4%
30	Mohammad Salman	0	15	15.00	29,538	1.1%
31	Ismaeel Mohammad Ismaeel	30	2	2.50	4,923	0.2%
32	Naheda Alrabade	0	1	1.00	1,969	0.1%
33	Awada mohammad Hamdan	30	0	0.50	985	0.0%
34	Ahmad Abdullah Alsunbol	30	15	15.50	30,523	1.2%
35	Khamis Jum'aa	0	3	3.00	5,908	0.2%
36	Ali Aldikhan sons	15	9	9.25	18,215	0.7%
37	Abdelaziz Ahmad Alssad	0.3	9	9.01	17,733	0.7%
38	Mohammad Salama Ameen	45	1	1.75	3,446	0.1%
39	Mohammad Habas	0.5	12	12.01	23,647	0.9%
40	Mohammad Saad	10	18	18.17	35,774	1.4%
41	Abdelkareem Jum'aa	37	4	4.62	9,091	0.3%
42	Abdullah Alhamad Duaiji	0	1	1.00	1,969	0.1%
43	Abdullah Alsalem	0	1	1.00	1,969	0.1%
44	Arjab	0	1	1.00	1,969	0.1%
45	Efheed 'Utaiat	50	10	10.83	21,333	0.8%
46	Shehadah Elmsalam	50	12	12.83	25,271	1.0%
47	Hasan Aldouni sons	0	2	2.00	3,938	0.2%
48	Awda Sulieman Aldouni	30	2	2.50	4,923	0.2%
49	Salem Mohammad Salem sons	10	44	44.17	86,973	3.3%
50	Taher Khamis	0.5	13	13.01	25,616	1.0%
51	Khamis Almaqboul	30	0	0.50	985	0.0%
	TOTAL	946.3	1304	1,319.77	2,598,889	100.0%

WATER RIGHT - DYUK

No	Name	DYK-FQ			DYK-TT			Total Hours	m3/yr	Weight
		Minutes	Hours	Total Hrs	Minutes	Hours	Total Hrs			
1	Basel Alhusaini and Um Haidar	0	68	68.00				68.00	240,508	4.9%
2	Jameel Sabri and His Sons		36	36.00				36.00	127,328	2.6%
3	Heirs Ibraheem Alhaziena		38	38.00				38.00	134,402	2.8%
4	Heirs Jodah Al Halaby		26	26.00				26.00	91,959	1.9%
5	Ibraheem Hasan Al Sarameh and His sons		32	32.00				32.00	113,180	2.3%
6	Siham Abu Sharmouj		6	6.00				6.00	21,221	0.4%
7	Alhaj Hasan and His Sons		24	24.00				24.00	84,885	1.7%
8	Hadeel Abu Elzulof		5	5.00				5.00	17,684	0.4%
9	Alhaj Saoud Aldewani		1	1.00				1.00	3,537	0.1%
10	Khader Attwan		1	1.00				1.00	3,537	0.1%
11	Abu Majid Al Silwany		2	2.00				2.00	7,074	0.1%
12	Mahmoud Salam Tareef		3	3.00				3.00	10,611	0.2%
13	Ziad Musa Musalam		1	1.00				1.00	3,537	0.1%
14	Fouad Asmar and his brothers		0	0.00				0.00	0	0.0%
15	Khadeeja Rizq		0	0.00				0.00	0	0.0%
16	Rebhi Barta'		4	4.00				4.00	14,148	0.3%
17	Mahmoud Samoor and his brothers		9	9.00				9.00	31,832	0.7%
18	Jaber Jaber		5	5.00				5.00	17,684	0.4%
19	Yousif Abu Sharar		2	2.00				2.00	7,074	0.1%
20	Salah Fayiz Eida		1	1.00				1.00	3,537	0.1%
21	Zahir Moustafa		0	0.00				0.00	0	0.0%
22	Mahmoud Eida		30	30.00				30.00	106,107	2.2%
23	Nihad Jad Allah		1	1.00				1.00	3,537	0.1%
24	Heirs Fayiz Beak Edrees		2	2.00				2.00	7,074	0.1%
25	Ein Soltan Camp		26	26.00				26.00	91,959	1.9%
26	Salem Al Azm		9	9.00				9.00	31,832	0.7%
27	Ahmad Abdelrahman Safi		6	6.00				6.00	21,221	0.4%
28	Farah Mouhamed Khalaf		3	3.00				3.00	10,611	0.2%
29	Darweesh Makyeh		5	5.00				5.00	17,684	0.4%
30	Yasir Abu Alsoud		0	0.00				0.00	0	0.0%
31	Hiam Abu Alsoud		0	0.00				0.00	0	0.0%
32	Eshaq Abu Alsoud		10	10.00				10.00	35,369	0.7%
33	Heirs Kamil Al Erany		17	17.00				17.00	60,127	1.2%
34	Hasan Tim And his Wife		1	1.00				1.00	3,537	0.1%
35	Bolos Abu Rizq	55	9	9.92				9.92	35,074	0.7%
36	Adnan Fresh	45	11	11.75				11.75	41,558	0.9%
37	Heirs Abu Rabe'e	20	4	4.33				4.33	15,327	0.3%
38	Asaad Abdel Mine'en	15	4	4.25				4.25	15,032	0.3%
39	Deer Alroom Qarantal	50	131	131.83				131.83	466,280	9.6%
40	Mahmoud Saed And his Brothers	0	5	5.00				5.00	17,684	0.4%
41	Mahmoud Esoud	15	0	0.25				0.25	884	0.0%
42	Ali Althlai	15	5	5.25				5.25	18,569	0.4%
43	Heirs Yousef musalam	40	2	2.67				2.67	9,432	0.2%
44	Abu Emad Al Zagal	30	3	3.50				3.50	12,379	0.3%
45	Ahmad Abu Ismael And His mather and His Brothers	14	1	1.23				1.23	4,362	0.1%
46	Salem Al Mutlaq	0	3	3.00				3.00	10,611	0.2%
47	Heirs Awad And Mouhamed Hasan Sa'aida	30	28	28.50				28.50	100,801	2.1%
48	Awad Al Salam	37	3	3.62				3.62	12,792	0.3%
49	Mosbah Al Kathmy	45	0	0.75				0.75	2,653	0.1%
50	Heirs Ali Al Hamdan	35	3	3.58				3.58	12,674	0.3%
51	Muhsen Hasan Ibyary	0	1	1.00				1.00	3,537	0.1%
52	Hasan Muhsen	30	0	0.50				0.50	1,768	0.0%
53	Ahmad Muhsen	15	0	0.25				0.25	884	0.0%
54	Ali Muhsen	25	1	1.42				1.42	5,011	0.1%
55	Mohamed Muhsen and Habas Eawadi	25	0	0.42				0.42	1,474	0.0%
56	Abed Muhsen	10	0	0.17				0.17	589	0.0%
57	Hasan Muhsen	45	0	0.75				0.75	2,653	0.1%
58	Ibraheem Ahmad Jaber	22	2	2.37				2.37	8,371	0.2%
59	Fahmi Raja'e And his Brothers	37	2	2.62				2.62	9,255	0.2%
60	Badreea Alhasan	37	0	0.62				0.62	2,181	0.0%
61	Shawqi Abdo	37	0	0.62				0.62	2,181	0.0%
62	Mahmoud Al Kalony	30	0	0.50				0.50	1,768	0.0%

63	Heirs Mouhamed Khalaf Alsamarat	30	2	2.50				2.50	8,842	0.2%
64	Darweesh Barham And his Brothers	15	1	1.25				1.25	4,421	0.1%
65	Mohamed Khalil Khamees	0	1	1.00				1.00	3,537	0.1%
66	Saif Al Khalidi	45	0	0.75				0.75	2,653	0.1%
67	Mohamed Hasan Alwalaji	30	2	2.50				2.50	8,842	0.2%
68	Deeb Aldawodi	30	0	0.50				0.50	1,768	0.0%
69	Mohamed Hasan Tim	15	5	5.25				5.25	18,569	0.4%
70	Heirs Mouhamed Saiim Darweesh	0	4	4.00				4.00	14,148	0.3%
71	Mohamed Za'aroor	20	2	2.33				2.33	8,253	0.2%
72	AbdelSamad And His Brothers	35	0	0.58				0.58	2,063	0.0%
73	Mohamed Asfoor	15	0	0.25				0.25	884	0.0%
74	Heirs Abu Ese'd Alafgani	24	4	4.40				4.40	15,562	0.3%
75	Ata Abu Awad And his Brothers	25	2	2.42				2.42	8,547	0.2%
76	Shafiq and Um Haidar	0	6	6.00				6.00	21,221	0.4%
77	Women Union	0	1	1.00				1.00	3,537	0.1%
78	Dr. Ala'araj Abu Gazala	0	1	1.00				1.00	3,537	0.1%
79	alhj Hamid	30	0	0.50				0.50	1,768	0.0%
80	Mohamed Ali Alhuseni	30	0	0.50				0.50	1,768	0.0%
81	Salman Abdel walee	10	0	0.17				0.17	589	0.0%
82	Mohamed Hasan Ala'ablm	0	1	1.00				1.00	3,537	0.1%
83	Ibraheem	35	1	1.58				1.58	5,600	0.1%
84	Shokri Hasan Alsarameh	0	9	9.00				9.00	31,832	0.7%
85	Abdallah Tomah	0	2	2.00				2.00	7,074	0.1%
86	Mahmoud Musalam	19	1	1.32				1.32	4,657	0.1%
87	Ali Huseen Musalam	15	0	0.25				0.25	884	0.0%
88	Ahmad Musalam	29	0	0.48				0.48	1,709	0.0%
89	Heirs Salam and salim AIEbad Abu Jabir	5	8	8.08				8.08	28,590	0.6%
90	Jameel Abdel Walee And His brothers	0	3	3.00				3.00	10,611	0.2%
91	Ahmad Abu Bakhitan	30	0	0.50				0.50	1,768	0.0%
92	Al Shekh Ismael Al jamal	15	0	0.25				0.25	884	0.0%
93	Mohamed Ahmad Tim	30	0	0.50				0.50	1,768	0.0%
94	Jameel Al Takroury	15	0	0.25				0.25	884	0.0%
95	Almukhmasi	0	1	1.00				1.00	3,537	0.1%
96	Ahmad Asmar	30	0	0.50				0.50	1,768	0.0%
97	Mohamed Asmar	27	0	0.45				0.45	1,592	0.0%
98	Ali Etfeezi and his Partners	27	0	0.45				0.45	1,592	0.0%
99	Dr. Sami Musalam	45	0	0.75				0.75	2,653	0.1%
100	Husain Abu Ayash And his Partners	15	0	0.25				0.25	884	0.0%
101	Hasan Alaelddin	30	0	0.50				0.50	1,768	0.0%
102	Ibshara Abu AlJamal	30	0	0.50				0.50	1,768	0.0%
103	turki Iba'ara	30	0	0.50				0.50	1,768	0.0%
104	Al Shekh Jebreel Abu Sloom	0	0	0.00				0.00	0	0.0%
105	Mohamed Salam Etreef	0	2	2.00				2.00	7,074	0.1%
106	Mahmoud Abu Askar	0	1	1.00				1.00	3,537	0.1%
107	Musa Alsalayma and his Brothers	0	1	1.00				1.00	3,537	0.1%
108	Abdelazeez Safi	45	0	0.75				0.75	2,653	0.1%
109	Abedi Ahmad Embark	0	17	17.00				17.00	60,127	1.2%
110	Basel Alhusaini and Um Haidar				35	86	86.58	86.58	306,236	6.3%
111	Jameel Sabri and His Sons				45	38	38.75	38.75	137,054	2.8%
112	Wazna Awwad Ahmad				0	29	29.00	29.00	102,570	2.1%
113	Alhaj Hasan and His Sons				57	19	19.95	19.95	70,561	1.5%
114	Ien Alsultan Camp				17	23	23.28	23.28	82,351	1.7%
115	Shafiq and Um Haidar				0	6	6.00	6.00	21,221	0.4%
116	Ali Alzalam				15	5	5.25	5.25	18,569	0.4%
117	Dr. Hasan Ala'araj				0	1	1.00	1.00	3,537	0.1%
118	Women Union				30	0	0.50	0.50	1,768	0.0%
119	Mohamed Ali Alhusaini				30	0	0.50	0.50	1,768	0.0%
120	Alhaj Hamed				30	0	0.50	0.50	1,768	0.0%
121	Mohamed As'aad				15	0	0.25	0.25	884	0.0%
122	Izhaq Abu Als'oud				0	11	11.00	11.00	38,906	0.8%
123	Ibraheem Alhaziena Sons				50	34	34.83	34.83	123,202	2.5%
124	Alhaj Joudah Sons				20	23	23.33	23.33	82,527	1.7%
125	Fayez Beik Idrees sons				30	2	2.50	2.50	8,842	0.2%
126	Mohamed Huain Itreejeh sons				30	2	2.50	2.50	8,842	0.2%
127	Alsheikh Jibreel Abu Sal'oum				0	2	2.00	2.00	7,074	0.1%

128	Samour Mubarak Sons			40	10	10.67	10.67	37,727	0.8%
129	Abd Ahmad Mubarak			37	16	16.62	16.62	58,771	1.2%
130	Saber Barakat sons			0	5	5.00	5.00	17,684	0.4%
131	Rebhi Barta'			48	3	3.80	3.80	13,440	0.3%
132	Yousif Allam Abu Sharar			6	2	2.10	2.10	7,427	0.2%
133	Nihaya Jarab'a			18	1	1.30	1.30	4,598	0.1%
134	Musbah Alkazmi			45	0	0.75	0.75	2,653	0.1%
135	Miryam Abdelghani with her sons			23	1	1.38	1.38	4,893	0.1%
136	Salem Mahmoud and his brothers			7	2	2.12	2.12	7,486	0.2%
137	Jum'aa Dahedah			52	0	0.87	0.87	3,065	0.1%
138	Ibraheem Hasan and His sons			37	27	27.62	27.62	97,677	2.0%
139	Falah Fayez Abdo			36	1	1.60	1.60	5,659	0.1%
140	Abu Idrees Hasan			30	0	0.50	0.50	1,768	0.0%
141	Siham Abu Sharmouj			52	3	3.87	3.87	13,676	0.3%
142	Mahmoud 'iedah and his partners			6	3	3.10	3.10	10,964	0.2%
143	Ziad Musa Musalam			14	4	4.23	4.23	14,973	0.3%
144	Muneer Musa Musalam			14	1	1.23	1.23	4,362	0.1%
145	Alhaj Saoud Aldewani			45	1	1.75	1.75	6,190	0.1%
146	Hadeel Abu Elzulof			55	5	5.92	5.92	20,927	0.4%
147	Ali Hasan			15	2	2.25	2.25	7,958	0.2%
148	Musa Alsalyama			0	1	1.00	1.00	3,537	0.1%
149	Hiam Abu Alsoud			35	0	0.58	0.58	2,063	0.0%
150	Islam Salem Sons			45	7	7.75	7.75	27,411	0.6%
151	Abu As'aad Alafaghani Sons			30	2	2.50	2.50	8,842	0.2%
152	Ibraheem Alraja			7	2	2.12	2.12	7,486	0.2%
153	Abd Raja Sons			22	2	2.37	2.37	8,371	0.2%
154	Mohamed Khalil Khamis			0	1	1.00	1.00	3,537	0.1%
155	Ahmad Rabe' Sons			20	4	4.33	4.33	15,327	0.3%
156	Mohamed Khalaf Sons			45	2	2.75	2.75	9,726	0.2%
157	Mohamed Sfour sons			30	0	0.50	0.50	1,768	0.0%
158	Jameela Takrori			15	0	0.25	0.25	884	0.0%
159	Badreca Alhusaini			37	0	0.62	0.62	2,181	0.0%
160	Shawqi Abdo			37	0	0.62	0.62	2,181	0.0%
161	Shukri Hasan			0	1	1.00	1.00	3,537	0.1%
162	Ismaeel Aljamal			30	0	0.50	0.50	1,768	0.0%
163	Bahjat Alirani			0	14	14.00	14.00	49,516	1.0%
164	Abu Rezeq			55	6	6.92	6.92	24,463	0.5%
165	Salem Alazem			1	7	7.02	7.02	24,817	0.5%
166	Adnan Fresh			0	12	12.00	12.00	42,443	0.9%
167	Mohamed Za'rour			20	2	2.33	2.33	8,253	0.2%
168	Khamis Tayem			45	1	1.75	1.75	6,190	0.1%
169	Mohamad Hasan Alablam			45	0	0.75	0.75	2,653	0.1%
170	Mahmoud Mohammad Alkalouni			30	1	1.50	1.50	5,305	0.1%
171	Deer Alroom			0	135	135.00	135.00	477,480	9.8%
172	Mohamed Hasan Tayem			15	0	0.25	0.25	884	0.0%
173	Atta Abu Isroor			22	13	13.37	13.37	47,276	1.0%
174	Sa'ad Alabed sons			45	4	4.75	4.75	16,800	0.3%
175	Salem Almutalak			0	3	3.00	3.00	10,611	0.2%
176	Abu Imad Alzaghhal			30	2	2.50	2.50	8,842	0.2%
177	Dr. Sami Musalam			25	1	1.42	1.42	5,011	0.1%
178	Darweesh Makyeh			30	5	5.50	5.50	19,453	0.4%
179	Yuosif Musalam Sons			23	4	4.38	4.38	15,503	0.3%
180	Mahmoud Musalam			19	2	2.32	2.32	8,194	0.2%
181	Ahmad Musalam			48	1	1.80	1.80	6,366	0.1%
182	Ali Hasan Musalam			15	0	0.25	0.25	884	0.0%
183	Abdelazeez Safi			45	0	0.75	0.75	2,653	0.1%
184	Abdullah Tuma			30	1	1.50	1.50	5,305	0.1%
185	Ibraheem Iwaidi			20	1	1.33	1.33	4,716	0.1%
186	As'aad Abdelmun'em			15	4	4.25	4.25	15,032	0.3%
187	Alshamas			0	1	1.00	1.00	3,537	0.1%
188	Hasan Alaelddin			30	0	0.50	0.50	1,768	0.0%
189	Bshara Abu Alhajal			30	0	0.50	0.50	1,768	0.0%
190	turki Ibaara			30	0	0.50	0.50	1,768	0.0%
191	Khader Attwan			30	0	0.50	0.50	1,768	0.0%
192	Salem Ahmad Darweesh			25	1	1.42	1.42	5,011	0.1%
193	Awwad Alsalam			15	4	4.25	4.25	15,032	0.3%
194	Abu Istivo			30	0	0.50	0.50	1,768	0.0%
195	Husain Baridi			30	10	10.50	10.50	37,137	0.8%

196	Ibraheem Mohammad Salem and Brothers				0	2	2.00	2.00	7,074	0.1%
197	Fouad Asmar and his brothers				30	0	0.50	0.50	1,768	0.0%
198	Ahmad Asmar				20	0	0.33	0.33	1,179	0.0%
199	Mohamed Asmar				20	0	0.33	0.33	1,179	0.0%
200	Almukhmasi				0	1	1.00	1.00	3,537	0.1%
201	Abd Alisa				35	0	0.58	0.58	2,063	0.0%
202	Abd Muhsen				10	0	0.17	0.17	589	0.0%
203	Hasan Muhsen				15	0	0.25	0.25	884	0.0%
204	Mohamed Muhsen and Habas al'iwaidi				45	0	0.75	0.75	2,653	0.1%
205	Muhsen Hasan				25	0	0.42	0.42	1,474	0.0%
206	Hasan Jubran				0	1	1.00	1.00	3,537	0.1%
207	Ahmad Alwadiani				5	2	2.08	2.08	7,369	0.2%
208	Lubna Alkhatdi				45	0	0.75	0.75	2,653	0.1%
209	Ahmad Abdelrahman Maddi				45	0	0.75	0.75	2,653	0.1%
210	Othman Jalilah				11	3	3.18	3.18	11,259	0.2%
211	Ahmad Quree'				0	1	1.00	1.00	3,537	0.1%
212	Ali Alfahed				30	0	0.50	0.50	1,768	0.0%
213	Suliman Younis				30	0	0.50	0.50	1,768	0.0%
214	Suliman Abu Aljnadi				40	0	0.67	0.67	2,358	0.0%
215	Abu Suliman				30	0	0.50	0.50	1,768	0.0%
216	Mohamed Askar				0	1	1.00	1.00	3,537	0.1%
	TOTAL	1,585	670	696.42	2,571	636	678.85	1,375.27	4,864,166	100.0%

WATER RIGHT - AUJA

No	Farmer Name	Water Right		Total Hours	m3/yr	Weight
		Minutes	Hours			
1	Ahmad Nusaiba	34	2	2.57	63,866	0.7%
2	Laila Nusaiba	34	2	2.57	63,866	0.7%
3	Musatafa Nusaiba	34	2	2.57	63,866	0.7%
4	Izhaq Nusaiba	34	2	2.57	63,866	0.7%
5	Fatema Nusaiba	34	2	2.57	63,866	0.7%
6	Sameer Nusaiba	15	4	4.25	105,752	1.1%
7	Shareef Nusaiba	15	7	7.25	180,401	1.9%
8	Alamad	20	19	19.33	481,069	5.0%
9	Deeb Abu Alfahad	12	3	3.20	79,625	0.8%
10	Almwalha	30	1	1.50	37,324	0.4%
11	Abdelsalam Albasha	48	0	0.80	19,906	0.2%
12	Azeez Jar Allah	40	18	18.67	464,481	4.9%
13	Sidqi Aldajani	10	7	7.17	178,327	1.9%
14	Saad Aldajani	20	6	6.33	157,592	1.7%
15	johny Albajali	10	3	3.17	78,796	0.8%
16	Abu Saleh Albajali	10	3	3.17	78,796	0.8%
17	Deab Nuaiba	18	2	2.30	57,231	0.6%
18	Sulieaman Alsayada	0	1	1.00	24,883	0.3%
19	Fares Abu Hamad	0	1	1.00	24,883	0.3%
20	Abu Fares Abu Hamad	15	3	3.25	80,869	0.8%
21	Hatem Abu Hamad	45	4	4.75	118,194	1.2%
22	Abd and Mahmoud Abu Hammad	50	7	7.83	194,916	2.0%
23	Dr. Naseem (Husain) Abu Hamad	30	1	1.50	37,324	0.4%
24	Dr. Naseem (Sulieaman) Abu Hamad	30	2	2.50	62,207	0.7%
25	Sulieaman Abu Hamad	45	1	1.75	43,545	0.5%
26	Alsheikh Fathe	30	2	2.50	62,207	0.7%
27	Abdelraouf Nusaiba	30	10	10.50	261,270	2.7%
28	Issa Alhusain	45	10	10.75	267,491	2.8%
29	Aljaraheed	50	1	1.83	45,619	0.5%
30	Abu Isha	30	1	1.50	37,324	0.4%
31	Fakhrya Jarhoud	55	4	4.92	122,341	1.3%
32	Almwalha and Abdelfaleh	37	0	0.62	15,344	0.2%
33	Jawdat Alhalabe (Abu Hadeed)	9	7	7.15	177,913	1.9%
34	jawdat Alhalabe (Alnaji)	18	14	14.30	355,825	3.7%
35	Fawzi Aldajani	3	6	6.05	150,541	1.6%
36	Yahia Hamouda (Alnaji)	10	5	5.17	128,562	1.3%
37	Ibraheem Alsaleh and Fayez (Barakat)	33	8	8.55	212,749	2.2%
38	Ibraheem Alsaleh and Fayez (Hamoud)	17	4	4.28	106,582	1.1%
39	Abdelkareem Njoom	10	7	7.17	178,327	1.9%
40	Mohammad Ibraheem Njoom	10	7	7.17	178,327	1.9%
41	Abdelraheem Ibraheem Njoom	10	7	7.17	178,327	1.9%
42	Salama Abu Zayed	1	1	1.02	25,298	0.3%
43	Abdelsaad and Mohammad Suieman Njoom	13	16	16.22	403,517	4.2%
44	Muhammad Abu Sultan Njoom	50	18	18.83	468,628	4.9%

45	Husain And Abdullah Salama Njoom	20	14	14.33	356,655	3.7%
46	Alquti And Subaeh	1	2	2.02	50,180	0.5%
47	Ramadan Turki	45	1	1.75	43,545	0.5%
48	Jem'aa (Sameer And Ibraheem)	45	1	1.75	43,545	0.5%
49	Fathi Fheed	45	1	1.75	43,545	0.5%
50	Taha Shalash	45	1	1.75	43,545	0.5%
51	Malek Shaklash	45	1	1.75	43,545	0.5%
52	Hamada Mansour	52.5	0	0.88	21,773	0.2%
53	Maher (Sameer and Ibraheem)	57	0	0.95	23,639	0.2%
54	Dr. Naseem Abu Jam'aa	55.5	5	5.93	147,431	1.5%
55	Efheed Abu Jam'aa	0	1	1.00	24,883	0.3%
56	Aldajani (The Girls)	22	18	18.37	457,016	4.8%
57	Aldajani (The Biys)	20	14	14.33	356,655	3.7%
58	Mohammad Alqutob	48	15	15.80	393,150	4.1%
59	Khaled Alqutob	48	15	15.80	393,150	4.1%
60	Mahmoud and Shalash Njoom	10	18	18.17	452,039	4.7%
61	Yousif Mahmoud Njoom	10	18	18.17	452,039	4.7%
	TOTAL	1663	356	383.72	9,547,978	100.0%

Annex 4.5

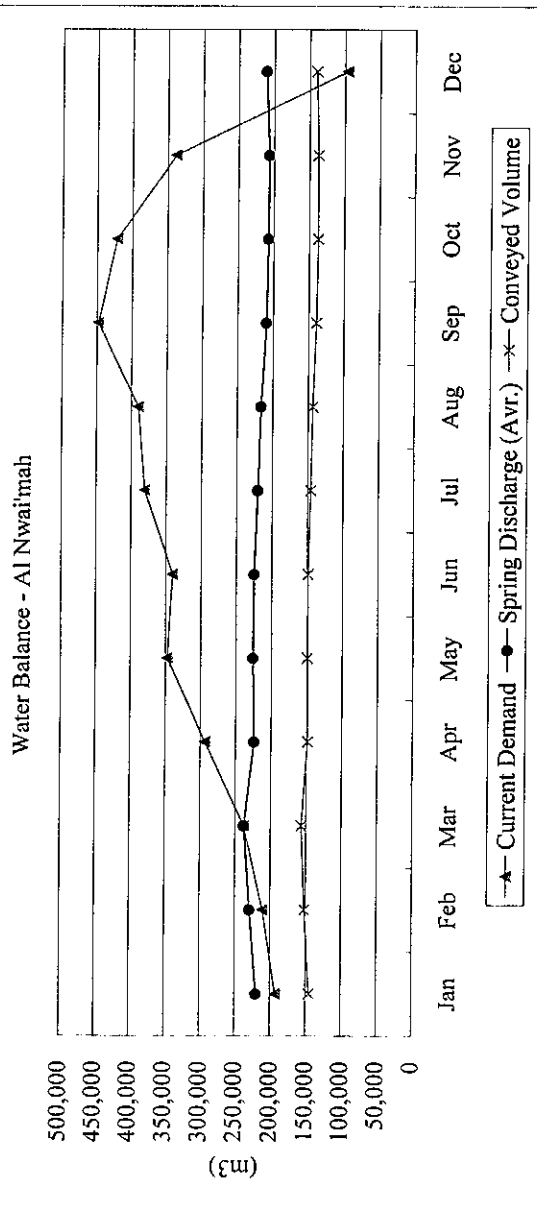
*Spring Water Balances for Agriculture in
Priority Sites*

Water Balance

Al Nwai'mah Spring

Current Irrigated Area	1,585 dunum
Future Irrigated Area	2,506 dunum

Item	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avr.
WATER DEMAND FOR SPRING														
Water Requirement For Irrigation	2,586,774	134,665	147,978	166,395	205,635	243,000	237,930	266,421	272,982	313,524	294,649	236,554	67,041	215,565
Future Requirement	4,089,878	212,915	233,963	263,083	325,124	384,201	376,185	421,231	431,604	495,704	465,862	374,009	105,997	340,823
Water Demand for Irr.	3,695,392	192,378	211,397	237,707	293,764	347,144	339,901	380,602	389,974	447,891	420,927	337,935	95,773	307,949
* Water Use Efficiency=0.7	5,842,683	304,164	334,233	375,832	464,462	548,859	537,407	601,759	616,577	708,149	665,517	534,299	151,424	486,890
WATER RESOURCE OF SPRING														
Spring Discharge (Avr.)	2,636,002	219,794	229,731	237,701	224,236	226,377	224,947	220,557	216,662	209,775	207,560	207,430	211,231	219,667
Conveyance Loss 34%	1,739,762	145,064	151,623	156,883	147,996	149,409	148,465	145,568	142,997	138,452	136,990	136,904	139,413	144,980
STORAGE														
	1,220,599			6	69,328	120,766	114,953	160,045	173,312	238,116	213,367	130,504		135,622

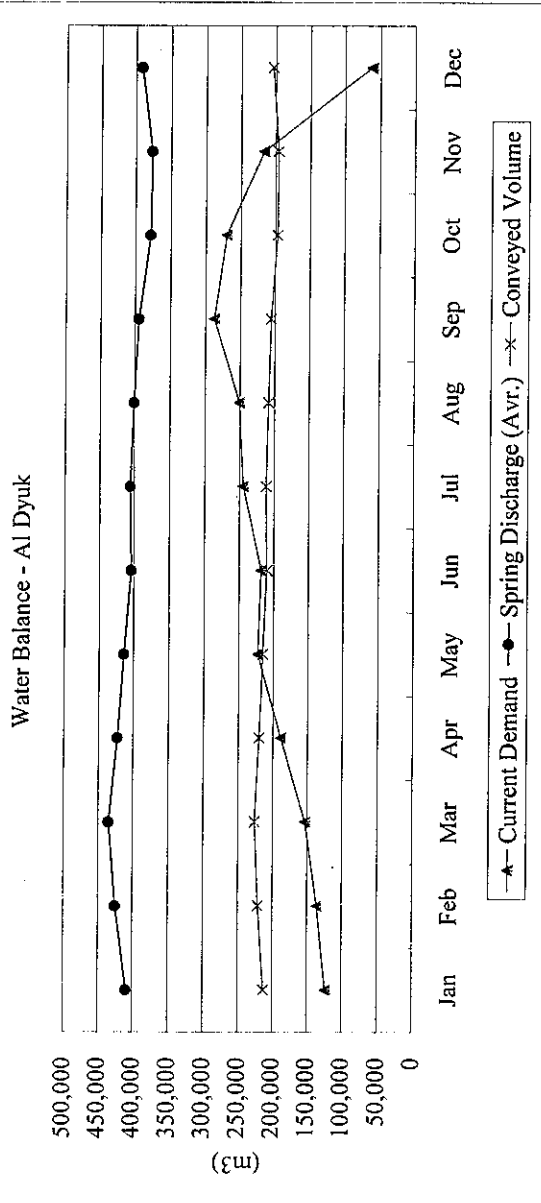


Water Balance

Al Dyuk Spring

Current Irrigated Area	1,017 dunum
Future Irrigated Area	1,997 dunum

Item	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avr.
WATER DEMAND FOR SPRING														
Water Requirement For Irrigation	1,659,779	86,406	94,948	106,766	131,944	155,919	152,666	170,947	175,156	201,170	189,059	151,783	43,016	138,315
Water Demand for Irr. * Water Use Efficiency=0.7	3,259,173	169,669	186,443	209,647	259,087	306,165	299,777	335,674	343,940	395,020	371,239	298,043	84,467	271,598
Future Demand	2,371,113	123,437	135,641	152,523	188,491	222,741	218,094	244,210	250,223	287,385	270,084	216,833	61,452	197,593
Future Demand	4,655,961	242,384	266,346	299,496	370,124	437,379	428,253	479,534	491,343	564,315	530,342	425,776	120,668	387,997
WATER RESOURCE OF SPRING														
Spring Discharge (Avr.)	4,856,110	408,937	424,850	434,646	422,597	413,962	403,308	405,747	400,775	394,683	378,425	376,744	391,436	404,676
Conveyed Volume	2,525,177	212,647	220,922	226,016	219,751	215,260	209,720	210,988	208,403	205,235	196,781	195,907	203,547	210,431
Loss 48%														
STORAGE														
	0													#DIV/0!

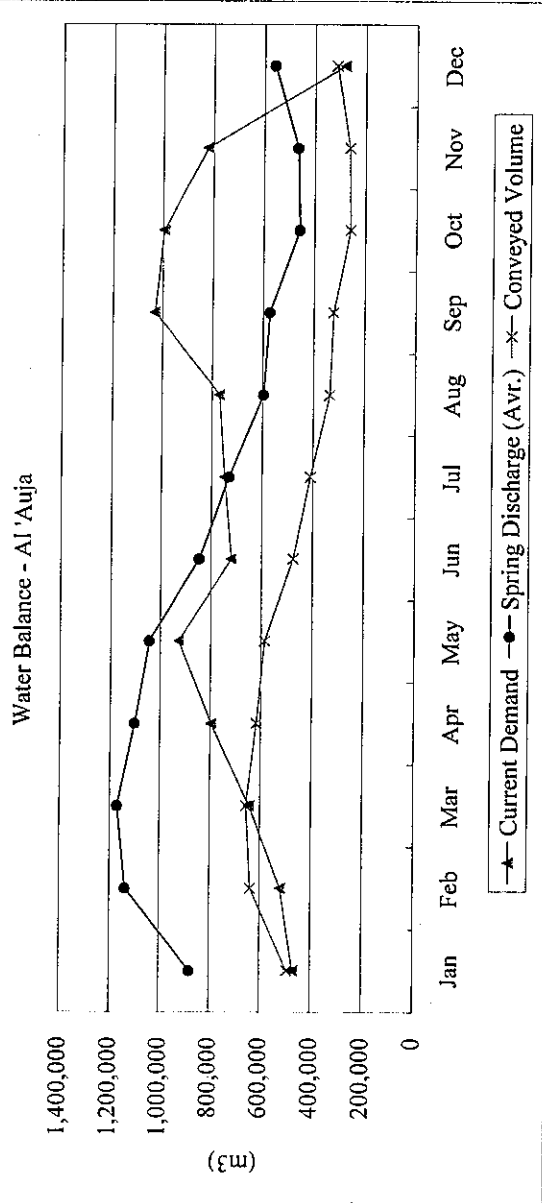


Water Balance

Al 'Auja Spring

Current Irrigated Area	4,642	dunum
Future Irrigated Area	9,921	dunum

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avr.
WATER DEMAND FOR SPRING													
Water Requirement For Irrigation	6,089,071	326,505	448,767	556,291	648,202	502,308	521,575	537,942	719,730	696,033	574,360	195,225	507,423
Future Requirement	13,013,717	697,815	959,116	1,188,920	1,385,354	1,073,546	1,114,724	1,149,704	1,538,226	1,487,580	1,227,536	417,239	1,084,476
Water Demand for Irr.	8,698,673	466,436	641,096	794,702	926,003	717,583	745,108	768,489	1,028,186	994,333	820,514	278,892	724,889
* Water Use Efficiency=0.7	18,591,025	996,878	1,370,166	1,698,458	1,979,078	1,533,637	1,592,463	1,642,434	2,197,465	2,125,114	1,753,623	596,056	1,549,252
WATER RESOURCE OF SPRING													
Spring Discharge	9,547,978	1,135,964	1,169,526	1,100,971	1,043,707	846,379	729,528	595,210	571,968	456,518	464,702	556,501	795,665
Conveyance Loss 44%	5,346,867	636,140	654,934	616,543	584,476	473,973	408,536	333,317	320,302	255,650	260,233	311,641	445,572
STORAGE													
	1,538,704						15,579	173,280	456,218	537,815	355,812		307,741



Water Requirement for Irrigation

Crop	Dunum	Water Requirement (m3)													
		1	2	3	4	5	6	7	8	9	10	11	12	Total	
NWAI'MAH															
Open Field (Irrigated)	3	203	221	240	163	185	44	0	0	0	28	101	140	1,325	
Open Field Vegetable (Irrigated)	725	25,377	30,486	31,099	40,701	33,282	1,514	0	0	40,306	61,188	60,864	32,578	357,394	
Protected Plants (Green House)	48	2,636	3,356	4,726	4,213	4,430	716	0	0	0	1,854	2,711	2,539	27,182	
Protected Plants (High Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Protected Plants (Low Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Fruit (Irrigated / Bearing)	390	10,381	13,841	22,133	38,552	60,826	81,722	99,094	103,297	93,812	67,447	37,161	452	628,718	
Fruit (Irrigated / UnBearing)	264	6,943	9,258	15,285	27,360	43,226	56,856	66,956	68,345	61,111	43,809	24,849	1,263	425,261	
Total	1,427	45,539	57,162	73,483	110,988	141,950	140,852	166,050	171,642	195,230	174,326	125,687	36,972	1,439,880	
DYUK															
Open Field (Irrigated)	3	151	164	178	121	138	33	0	0	0	21	75	104	986	
Open Field Vegetable (Irrigated)	539	18,884	22,687	23,142	30,288	24,768	1,126	0	0	29,995	45,533	45,293	24,243	265,960	
Protected Plants (Green House)	23	1,234	1,571	2,212	1,972	2,074	335	0	0	0	868	1,269	1,188	12,723	
Protected Plants (High Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Protected Plants (Low Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Fruit (Irrigated / Bearing)	362	9,611	12,815	20,492	35,694	56,317	75,664	91,748	95,640	86,858	62,447	34,407	418	582,114	
Fruit (Irrigated / UnBearing)	245	6,429	8,572	14,152	25,332	40,022	52,641	61,993	63,279	56,581	40,562	23,007	1,169	393,738	
Total	1,175	36,309	45,809	60,177	93,407	123,318	129,800	153,741	158,919	173,434	149,432	104,051	27,124	1,255,521	
AUJA															
Open Field (Irrigated)	464	25,371	34,260	42,892	32,990	36,207	0	0	0	0	670	13,772	17,750	203,912	
Open Field Vegetable (Irrigated)	2,644	114,950	127,915	170,195	227,324	231,148	45,573	0	0	217,636	289,062	269,190	169,825	1,862,819	
Protected Plants (Green House)	57	5,526	6,373	7,983	6,014	5,943	1,685	0	0	0	4,569	5,638	5,412	49,143	
Protected Plants (High Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Protected Plants (Low Tunnels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Fruit (Irrigated / Bearing)	1,130	140,240	150,176	175,825	223,050	287,878	349,460	401,314	414,669	387,636	310,352	220,961	173	3,061,732	
Fruit (Irrigated / UnBearing)	347	40,418	43,408	51,872	66,913	87,027	105,591	120,262	123,274	114,458	91,380	64,798	2,065	911,465	
Total	4,642	326,505	362,131	448,767	556,291	648,202	502,308	521,575	537,942	719,730	696,033	574,360	195,225	6,089,071	

Note:

- The irrigated area data available in MOA is applied.
- The total irrigated area for Nwimah and Dyuk is referred to the MOA data, but the total area is divided into irrigated areas for each village based on the acrio-photo.
- The water requirement unit for each crop is estimated based on the data of crop water requirement in Jericho available in MOA.

Annex 4.6

*Proposed Design Flows for Priority
Schemes*

Design Flow for Conveyance System

	Nwai'mah	Dyuk	Auja
(1) Average Flow (m3/hr)	334	537	1,203
(2) Maximum Flow (m3/hr)	412	753	2,904
(3) Minimum Flow (m3/hr)	101	351	0
(4) Annual Peak Rate	1.15	1.19	1.95
(5) Monthly Peak Rate	1.14	1.21	1.80
(6) Design Peak Rate	1.31	1.44	3.50
(7) Design Peak Flow	440	772	4,214
(8) Rev. Design Peak Flow	440	772	1,788
			(Max. Monthly Avr.)
(9) Other Demand (Max. in 2015)	36	28	0
<u>Domestic Water</u>			
Domestic in 2015 (m3/yr)	77,570	118,585	0
Domestic in 2015 (m3/month)	6,464	9,882	0
Domestic in 2015 (m3/day)	215	329	0
Domestic in 2015 (m3/hr)	9	14	0
Max. Daily Demand in 2015 (m3/hr) (Peak Rate = 2.0)	18	28	0
<u>Industrial Water</u>			
Current (m3/day)	170		
Future (m3/day) (Growth=31% from 2007 to 2015)	223		
* Based on demand growth in Jericho Gov.			
Daily Demand in 2015 (m3/hr)	9		
Max. Daily Demand in 2015 (m3/hr) (Peak Rate = 2.0)	18		
Desing Flow (8)-(9)	404	744	1,788

Source: Last 20-year data in PWA Database (1987-2006)

Discharge Record - Al Nwai'mah Spring

(Last 40 years)

Year	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
1960											121				121
1963		171			182	272		189				182	171	272	199
1964					301	320	296	296	296	296	282	273	273	320	295
1965		296	320	278	130	123	229	264	273	259	268	252	123	320	245
1966	229	268	273	259	264	250			229	224	216	228	216	273	244
1967					224				204				204	224	214
1968		301	291	292	242			247	279			280	278	242	276
1969	293	286	271	264	258	274	262	262	256	283	261	234	234	293	267
1970	257	247	203	252	258	258	266	239	235	246	217	203	203	266	240
1971	192	251	239	222	250	239	248	248	236	235	211	256	192	256	236
1972	272	315	260	280	278	294	283	261	237	238	255	239	237	315	268
1973	273	256	253	200	257	220	207	273	230	219	226	211	200	273	235
1974		270	309	276	260	272	273	256	262	250	250	274	250	309	268
1975	241	262	265	265	296	228	275	269	274	207	242	218	207	296	253
1976	236	229	281	248	269	266	286	251	255	274	232	237	229	286	255
1977	233	275	277	264	253	268	257	235	225	224	212	210	210	277	244
1978	285	272	284	264	280	277	271	256	243	203	225	237	203	285	258
1979	237	296	276	262	285	283	231	200	197	190	176	283	176	296	243
1980	306	317	315	313	264	275	264	284	285	278	275	282	264	317	288
1981	303	306	344	303	305	263	267	291	270	325	361	319	263	361	305
1982	291	348	298	351	379	318	363	347	358	392	350	335	291	392	344
1983	370	364	423	377	367	342	344	324	309	359	357	320	309	423	355
1984	335	384	399	373	402	359	335	328	319	339	270	294	270	402	345
1985	328	295	381	378	366	328	369	322	339	336	317	317	295	381	340
1986	283	288	378	328	257	349	267	245	276	227	309	323	227	378	294
1987	361	358	291	364	387	341	300	352	297	271	296	269	269	387	324
1988	359	344	381	337	316	347	364	360	351	335	318	350	316	381	347
1989	356	362	348	361	385	358	328	342	315	312	332	316	312	385	343
1990	324	345	346	353	316	352	333	353	364	352	339	296	296	346	340
1991	298	391	405	374	309	335	329	297	283	269	261	367	261	405	327
1992	356	387	412	409	401	357	369	338	372	334	355	373	334	412	372
1993	373	389	382	371	370	384	368	340	328	336	325	362	325	389	361
1994	298	325	345		354	333	350	368	362	361		361	298	368	346
1995	348	346	383	361	348	355	337		363	315	325	317	315	383	345
1996	318	310		357	315	347	318	347	319	318	317	321	310	357	326
1997	326		392	343	374	389	303	348	314	315	327	330	303	392	342
1998	321	365	357	356	320	315	335	377	319	332	319	332	315	377	338
1999	316	310	324	310	302	297	321	267	286	265	246	252	246	324	291
2000	291	307	325	289	294	320	305	288					288	325	302
2001				307	299					241	237		237	307	271
2002	278	345								266			266	345	297
2003		303	363	356	409	360		317			327	315	303	409	344
2004	314		388	369	314	320	323	314		346	357	305	305	388	335
2005	357	346	343	294	308		365	387	342	296	379	333	294	387	341
2006	355	391	353	101	389								101	391	318
m3/hr	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	192	229	203	101	224	220	207	200	197	190	176	203	101	229	195
Max	373	391	423	409	409	389	369	387	372	361	379	373	361	423	385
Avr	305	319	330	311	314	312	306	301	291	288	288	293	288	330	305
	1.00	1.05	1.08	1.02	1.03	1.02	1.00	0.99	0.95	0.94	0.94	0.96			1.00
m3/month	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	138,413	164,851	146,189	72,835	161,585	158,112	149,040	143,856	142,042	136,598	127,008	146,189	72,835	164,851	140,560
Max	268,790	281,750	304,819	294,451	294,451	279,936	265,680	278,640	268,013	282,528	272,678	268,531	265,680	304,819	280,022
Avr	219,794	229,731	237,701	224,236	226,377	224,947	220,557	216,662	209,775	207,560	207,430	211,231	207,430	237,701	219,667
	720.42	752.99	779.11	734.98	741.99	737.31	722.92	710.15	687.58	680.32	679.89	692.35	679.89	779.11	720.00

Design Flow Calculation - Al Nwai'mah Spring

Summary of Last 20 years Data															
m3/hr	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	278	303	291	101	294	297	300	267	283	241	237	252	101	303	262
Max	373	391	412	409	409	389	369	387	372	361	379	373	361	412	385
Avr	330	349	361	334	343	344	334	337	330	310	316	325	310	361	334
	0.99	1.04	1.08	1.00	1.02	1.03	1.00	1.01	0.99	0.93	0.95	0.97	0.93	1.08	1.00
m3/month	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	200,102	218,246	209,434	72,835	211,507	213,581	215,654	192,586	203,990	173,405	170,294	181,181	72,835	218,246	188,568
Max	268,790	281,750	296,525	294,451	294,451	279,936	265,421	278,640	268,013	259,718	272,678	268,531	259,718	296,525	277,409
Avr	237,960	250,921	259,947	240,408	246,745	247,957	240,683	242,773	237,390	222,927	227,691	233,973	222,927	259,947	240,781
	779.96	822.44	852.03	787.98	808.75	812.73	788.89	795.74	778.09	730.69	746.30	766.89	730.69	852.03	789.21

Average Flow	334 (m3/hr)
Annual Peak Rate	1.15
Monthly Peak Rate	1.14 (March)
Design Peak Rate	1.31
Design Max. Flow	440 (m3/hr)
Design Flow	440 (m3/hr)

Discharge Record - Al Dyuk Spring
(Last 40 years)

Year	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
1960											367				367
1962						461							461	461	461
1963		422			392			332					332	422	382
1964				326	665	647	651	740	635	647	629	617	326	740	618
1965		709	715	665	645	617	529	647	804	635	659	599	529	804	657
1966	641	647	587	647	599	463			435	443	410	369	369	647	524
1967					513				647			558	587	513	647
1968	593	665	665	617	599			587	563		658	664	563	665	624
1969	670	678	636	592	617	626	627	595	647	601	624	635	592	678	629
1970	582	556	562	608	615	598	575	592	534	533	453	430	430	615	553
1971	420	602	649	702	661	625	615	611	584	568	523	568	420	702	594
1972	693	702	682	649	630	645	590	602	617	629	613	619	590	702	639
1973	652	629	637	582	590	598	527	544	490	480	471	480	471	652	557
1974		669	670	583	580	607	584	613	639	678	630	560	560	678	619
1975	613	649	639	522	620	493	603	520	530	580	504	526	493	649	567
1976	574	563	691	658	579	620	613	625	585	565	534	563	534	691	597
1977	550	615	657	613	567	584	566	557	490	454	450	418	418	657	543
1978	650	679	648	670	682	597	620	661	513	457	469	581	457	682	602
1979	498	624	592	608	587	494	470	458	464	424	414	658	414	658	524
1980	654	699	679	682	651	658	641	624	643	666	620	581	581	699	650
1981	698	688	724	685	637	606	652	631	617	454	539	514	454	724	620
1982	595	625	649	632	591	573	581	555	605	579	511	534	511	649	586
1983	558	567	617	632	532	535	576	526	593	598	519	547	519	632	567
1984	511	537	531	624	555	555	551	587	561	578	554	518	511	624	555
1985	535	533	609	552	548	559	584	603	513	537	509	470	470	609	546
1986	472	540	624	636	572	555	546	482	444	476	586	627	444	636	547
1987	657	632	558	562	602	558	612	582	539	561	531	485	485	657	573
1988	602	627	593	552	592	552	549	580	546	500	566	517	500	627	565
1989	609	591	594	662	585	540	571	572	586	577	584	561	540	662	586
1990	540	580	618	563	556	587	586	606	599	598	477	471	471	618	565
1991	413	528	564	521	567	575	590	637	557	505	496	753	413	753	559
1992	656	603	661	607	662	558	545	551	502	504	559	567	502	662	581
1993	605	563	562	574	541	530	521	543	546	525	553	521	521	605	549
1994	523	519	568		552	570	568	515	528	491		557	491	570	539
1995	552	567	557	521	550	532	530		534	490	483	499	483	567	529
1996	526	475		539	524	509	536	555	481	521	491	696	475	696	532
1997	532		519	530	496	515	492	505	513	477	498	477	477	532	505
1998	507	541	567	508	488	511	498	518	460	450	467	463	450	567	498
1999	476	481	453	512	481	403	398	401	421	395	402	351	351	512	431
2000	499	492	497	509	502	491	494	433					433	509	490
2001				491	495					380	417		380	495	446
2002	541	557								594			541	594	564
2003		576	591	622	620	593		456			512	548	456	622	565
2004	528		567	515	535	493	521	499		486	511	491	486	567	515
2005	586	512	560	546	572		630	557	547	483	552	536	483	630	553
2006	576	575	543	536	577								536	577	561
m3/hr	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	413	475	453	491	481	403	398	401	421	380	402	351	351	491	422
Max	698	702	724	702	682	658	652	661	647	678	658	753	647	753	685
Avr	568	590	604	587	575	560	564	557	548	526	523	544	523	604	562
	1.01	1.05	1.07	1.04	1.02	1.00	1.00	0.99	0.98	0.94	0.93	0.97			1.00
m3/month	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	297,043	342,144	325,814	353,808	346,291	290,304	286,416	288,490	303,264	273,715	289,526	252,461	252,461	353,808	304,106
Max	502,330	505,440	521,510	505,181	491,184	473,558	469,152	475,891	466,042	488,074	473,558	542,246	466,042	542,246	492,847
Avr	408,937	424,850	434,646	422,597	413,962	403,308	405,747	400,775	394,683	378,425	376,744	391,436	376,744	434,646	404,676
	597.42	620.66	634.97	617.37	604.76	589.19	592.76	585.49	576.59	552.84	550.38	571.85	550.38	634.97	591.19

Design Flow Calculation - Al Dyuk Spring

Summary of Last 20 years Data															
m3/hr	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	413	475	453	491	481	403	398	401	421	380	402	351	351	491	422
Max	657	632	661	662	662	593	630	637	599	598	584	753	584	753	639
Avr	552	554	563	548	552	532	540	532	526	502	506	531	502	563	537
	1.03	1.03	1.05	1.02	1.03	0.99	1.01	0.99	0.98	0.94	0.94	0.99	0.94	1.05	1.00
m3/month	1	2	3	4	5	6	7	8	9	10	11	12	Min	Max	Avr
Min	297,043	342,144	325,814	353,808	346,291	290,304	286,416	288,490	303,264	273,715	289,526	252,461	252,461	353,808	304,106
Max	473,040	455,155	476,150	476,928	476,410	426,902	453,341	458,784	431,309	430,790	420,422	542,246	420,422	542,246	460,123
Avr	397,123	398,970	405,381	394,776	397,749	383,260	388,832	382,952	378,460	361,614	364,451	382,158	361,614	405,381	386,311
	580.16	582.85	592.22	576.73	581.07	559.90	568.04	559.45	552.89	528.28	532.43	558.29	528.28	592.22	564.36

Average Flow	537 (m3/hr)
Annual Peak Rate	1.19
Monthly Peak Rate	1.21 (April)
Design Peak Rate	1.44
Design Max. Flow	772 (m3/hr)
Design Flow	772 (m3/hr)

Discharge Record - AI 'Auja Spring
(Last 40 years)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Avr
1967										1,292	1,337				1,314
1968	1,247			1,718	1,669	1,524	1,247	1,203		909	829	746	746	1,718	1,232
1969	791			1,869	1,869	1,818	1,620		1,383	1,159	1,073	990	791	1,869	1,397
1970	829	1,116	1,669		1,247	791	679	608		505	441	379	379	1,669	826
1971	293		1,159	829	1,718	1,429	990	791	608	505	441	1,429	293	1,718	927
1972	1,669	1,869	1,768	1,768	1,669	1,572	1,337	1,203	949	791	716	608	608	1,869	1,327
1973	1,429	1,031	1,524	1,159	829	643	505	410	350	295	240	215	215	1,524	719
1974	608	1,920	1,972	1,818	1,818	1,768	1,718	1,524	1,477	1,337	1,159	1,203	608	1,972	1,527
1975	1,292	1,669	1,768	1,718	1,669	1,572	1,429	1,297	1,074	990	897	829	829	1,768	1,350
1976	753	679	1,620	1,669	1,383	1,074	868	643	573	441	410	350	350	1,669	872
1977	304	1,337	984	1,341	949	473	350	266	215	167	145	163	145	1,341	558
1978	1,383	441	990	1,429	791	441	293	191	124	104	124	37	37	1,429	529
1979	376	990	124	215	68	0	0	0	0	0	0	1,236	0	1,236	251
1980	2,056	1,818	1,972	1,669	1,718	1,572	1,383	1,116	791	539	441	379	379	2,056	1,288
1981	1,524	1,920	1,768	1,718	1,718	1,620	1,524	1,292	1,159	868	716	539	539	1,920	1,364
1982	410	1,572	1,620	1,620	1,524	1,429	1,203	990	716	539	410	350	350	1,620	1,032
1983	1,524	1,718	2,586	1,920	1,869	1,718	1,689	1,669	1,524	1,524	1,429	1,337	1,337	2,586	1,709
1984	1,247	1,620	1,572	1,718	1,524	1,203	990	829	679	539	492	410	410	1,718	1,069
1985	350	1,247	1,718	1,620	1,202	990	505	473	350	266	240	191	191	1,718	763
1986	122	719	829	215	124	52	13	0	0	0	1,247	921	0	1,247	354
1987	1,637	1,844	1,637	1,477	1,116	753	365	191	103	51	14	595	14	1,844	815
1988	1,574	1,844	1,844	1,869	1,929	1,823	1,679	1,518	1,182	788	549	496	496	1,929	1,424
1989	1,714	1,744	1,700	1,876	1,508	1,200	813	532	407	266	191	171	171	1,876	1,010
1990	1,619	1,801	1,860	1,830	1,299	973	566	345	227	167	93	45	45	1,860	902
1991	0	653	988	972	357	135	24	0	0	0	0	1,926	0	1,926	421
1992	1,842	2,547	2,200	1,995	1,126	2,162	1,942	2,018	1,986	1,819	1,660	2,407	1,660	2,547	2,059
1993	2,408	2,484	2,412	2,327	2,143	2,053	1,894	1,939	1,756	1,737	1,569	1,401	1,401	2,484	2,010
1994	1,429	1,559	1,954		1,801	1,459	1,071	984	912	771		1,904	771	1,954	1,385
1995	1,883	1,916	2,050	1,951	1,824	1,635	1,165	961	769	799	607	607	607	2,050	1,415
1996	1,709	1,320		2,152	1,592	1,237	942	688	525	409	394	301	301	2,152	1,024
1997	1,215		1,648	1,743	1,740	1,480	1,259	1,008	756	613	515	761	515	1,743	1,158
1998	1,208	1,850	1,759	1,720	1,678	1,482	1,238	1,018	759	580	455	363	363	1,850	1,176
1999	380	590	291	205	156	83	32	11	0	0	0	0	0	590	146
2000	895	1,412	1,133	678	207	78	0	0					0	1,412	550
2001				0							397				199
2002		1,817										1,351			1,584
2003	1,138		2,134		2,340		2,480		2,454		1,968	1,509	1,138	2,480	2,003
2004	2,328	2,600	2,607	1,890	2,074	1,727	1,070	1,119		480	968	1,126	480	2,607	1,635
2005	2,062	2,384	2,261	2,904	2,145		1,593	1,406	1,425	974	879	550	550	2,904	1,689
2006	1,822	2,035	1,106	1,917	2,242								1,106	2,242	1,824
m3/hr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Avr
Min	0	441	124	0	68	0	0	0	0	0	0	0	0	441	53
Max	2,408	2,600	2,607	2,904	2,340	2,162	2,480	2,018	2,454	1,819	1,968	2,407	1,819	2,904	2,347
Avr	1,218	1,578	1,624	1,529	1,450	1,176	1,013	827	794	634	645	773	634	1,624	1,105
	1.10	1.43	1.47	1.38	1.31	1.06	0.92	0.75	0.72	0.57	0.58	0.70			1.00
m3/month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Avr
Min	0	317,261	89,165	0	48,730	0	0	0	0	0	0	0	0	317,261	37,930
Max	1,734,048	1,871,683	1,877,386	2,091,226	1,685,059	1,556,755	1,785,629	1,452,816	1,767,226	1,309,478	1,416,787	1,733,011	1,309,478	2,091,226	1,690,092
Avr	877,003	1,135,964	1,169,526	1,100,971	1,043,707	846,379	729,528	595,210	571,968	456,518	464,702	556,501	456,518	1,169,526	795,665
	1.10	1.43	1.47	1.38	1.31	1.06	0.92	0.75	0.72	0.57	0.58	0.70	0.57	1.47	1.00

Design Flow Calculation - AI 'Auja Spring

Summary of Last 20 years Data															
m3/hr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Avr
Min	0	590	291	0	156	78	0	0	0	0	0	0	0	590	93
Max	2,408	2,600	2,607	2,904	2,340	2,162	2,480	2,018	2,454	1,819	1,968	2,407	1,819	2,904	2,347
Avr	1,492	1,788	1,740	1,618	1,571	1,219	1,067	852	897	628	653	913	628	1,788	1,203
	1.24	1.49	1.45	1.34	1.31	1.01	0.89	0.71	0.75	0.52	0.54	0.76			1.00
m3/month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Avr
Min	0	424,829	209,434	0	111,974	56,246	0	0	0	0	0	0	0	424,829	66,874
Max	1,734,048	1,871,683	1,877,386	2,091,226	1,685,059	1,556,755	1,785,629	1,452,816	1,767,226	1,309,478	1,416,787	1,733,011	1,309,478	2,091,226	1,690,092
Avr	1,074,537	1,287,507	1,252,973	1,164,952	1,131,106	877,461	767,979	613,250	645,674	452,339	470,278	657,057	452,339	1,287,507	866,259
	1.35	1.62	1.57	1.46	1.42	1.10	0.97	0.77	0.81	0.57	0.59	0.83	0.57	1.62	1.09

Average Flow	1,203 (m3/hr)
Annual Peak Rate	1.95
Monthly Peak Rate	1.80 (April)
Design Peak Rate	3.50
Design Max. Flow	4,214 (m3/hr)
Design Flow	4,214 (m3/hr)
Revised Design Flow	1,788 (m3/hr)

* Monthly Max Average Flow (February)

Annex 4.7

Design Calculations for Priority Schemes

Hydraulic Calculation for Priority Schemes

Line	Node	Length (m)	Inside Dia.		Pipe Material	C	R	Head (m)	I	V (m/s)	Q		Required Q		Note
			(inch)	(mm)							m ³ /hr	L/s	m ³ /hr	L/s	
NWAIM/MAH	0	80													
	1	1,320	12	304.8	HDPE	150	0.076	18	0.0133	2.44	640	178	404	112	
	2	940													
	2	620	12	304.8	HDPE	150	0.076	4	0.0065	1.65	434	120	404	112	
	8	860	12	304.8	HDPE	150	0.076	12	0.0134	2.45	643	179	404	112	
	4	1,360	10	254	HDPE	150	0.064	19	0.0140	2.23	408	113	404	112	
	5	721	8	203.2	HDPE	150	0.051	30	0.0411	3.47	406	113	404	112	P.R.V. is required
	5	761	8	203.2	HDPE	150	0.051	32	0.0421	3.52	411	114	404	112	P.R.V. is required
	9	430	12	304.8	HDPE	150	0.076	6	0.0132	2.43	639	178	404	112	
	10	430	10	254	HDPE	150	0.064	7	0.0167	2.46	448	124	404	112	

Line	Node	Length (m)	Inside Dia.		Pipe Material	C	R	Head (m)	I	V (m/s)	Q		Required Q		Note
			(inch)	(mm)							m ³ /hr	L/s	m ³ /hr	L/s	
DYUK	0	120													
	1	500	22	558.8	SP	130	0.140	1	0.0017	1.02	901	250	744	207	
	2	600													
	2	850	18	457.2	SP	130	0.114	4	0.0044	1.51	892	248	744	207	
	4	800	16	406.4	SP	130	0.102	5	0.0059	1.64	767	213	744	207	
	5	440	18	457.2	SP	130	0.114	2	0.0056	1.71	1,013	281	744	207	
	11	510	12	304.8	HDPE	150	0.076	12	0.0244	3.39	890	247	744	207	P.R.V. is required
	6	801	12	304.8	SP	130	0.076	29	0.0361	3.63	953	265	744	207	P.R.V. is required
	12	701													
	13	80	16	406.4	HDPE	150	0.102	1	0.0071	2.09	975	271	744	207	
	14	160	16	406.4	HDPE	150	0.102	1	0.0079	2.21	1,034	287	744	207	
	15	430													
	6	311	10	254	HDPE	150	0.064	28	0.0913	6.16	1,123	312	744	207	P.R.V. is required
	8	261	10	254	HDPE	150	0.064	17	0.0669	5.21	950	264	744	207	P.R.V. is required
	16	900	16	406.4	HDPE	150	0.102	4	0.0048	1.69	788	219	744	207	
	16	980	12	304.8	HDPE	150	0.076	21	0.0219	3.19	839	233	744	207	P.R.V. is required
	8	431	10	254	HDPE	150	0.064	24	0.0563	4.74	865	240	744	207	P.R.V. is required
	10	60	14	355.6	HDPE	150	0.089	1	0.0117	2.51	896	249	744	207	
	18	200	14	355.6	HDPE	150	0.089	2	0.0116	2.49	891	248	744	207	

Line	Node	Length (m)	Inside Dia.		Pipe Material	C	R	Head (m)	I	V (m/s)	Q		Required Q		Note
			(inch)	(mm)							m3/hr	L/s	m3/hr	L/s	
AUJA															
A-0	0	741													
A-1	1	753													
A-2.1	2	960	14	355.6	HDPE	150	0.089	51	0.0531	5.68	2,031	564	1,788	497	P.R.V. is required
A-2.2	14	288	20	508	SP	130	0.127	3	0.0105	2.57	1,873	520	1,788	497	
A-3	3	3,415	16	406.4	HDPE	150	0.102	104	0.0306	4.58	2,141	595	1,788	497	P.R.V. is required
A-4	4	1,643	18	457.2	SP	130	0.114	36	0.0217	3.56	2,104	584	1,788	497	P.R.V. is required
A-5	5	176	22	558.8	SP	130	0.140	1	0.0080	2.36	2,081	578	1,788	497	
A-6	6	910	20	508	SP	130	0.127	9	0.0097	2.46	1,792	498	1,788	497	
A-7	6	527	18	457.2	SP	130	0.114	10	0.0182	3.24	1,914	532	1,788	497	P.R.V. is required
A-8	8	1,440	26	660.4	SP	130	0.165	5	0.0037	1.73	2,128	591	1,788	497	
A-9.1	8	467	16	406.4	HDPE	150	0.102	18	0.0381	5.16	2,410	669	1,788	497	P.R.V. is required
A-9.2	15	342	20	508	SP	130	0.127	4	0.0114	2.69	1,960	544	1,788	497	
A-9.3	16	172	20	508	SP	130	0.127	2	0.0106	2.59	1,888	524	1,788	497	
A-10	5	1,040	18	457.2	SP	130	0.114	18	0.0170	3.12	1,841	511	1,788	497	P.R.V. is required
A-11	11	566	18	457.2	SP	130	0.114	11	0.0200	3.41	2,014	559	1,788	497	P.R.V. is required
A-12	12	1,668	20	508	SP	130	0.127	21	0.0125	2.82	2,055	571	1,788	497	

Design Calculation for Settling Basin

Nwaimah	Dyuk	Auja
$V_c = \text{Settling velocity of particle} = (g * (\rho_s - \rho) * d^2) / (18 * \mu)$ $\rho_s = \text{density of particle} = 1.5$ $\rho = \text{density of fluid} = 1$ $g = \text{acceleration due to gravity} = 9800$ $d = \text{diameter of particle} = 0.25 \text{ mm}$ $\mu = \text{viscosity of liquid} = 1.027$	$V_c = \text{Settling velocity of particle} = (g * (\rho_s - \rho) * d^2) / (18 * \mu)$ $\rho_s = \text{density of particle} = 1.5$ $\rho = \text{density of fluid} = 1$ $g = \text{acceleration due to gravity} = 9800$ $d = \text{diameter of particle} = 0.25 \text{ mm}$ $\mu = \text{viscosity of liquid} = 1.027$	$V_c = \text{Settling velocity of particle} = (g * (\rho_s - \rho) * d^2) / (18 * \mu)$ $\rho_s = \text{density of particle} = 1.5$ $\rho = \text{density of fluid} = 1$ $g = \text{acceleration due to gravity} = 9800$ $d = \text{diameter of particle} = 0.25 \text{ mm}$ $\mu = \text{viscosity of liquid} = 1.027$
$V_c = 16.57 \text{ mm/s}$ $= 1,431 \text{ m/day}$ $Q = 404 \text{ m}^3/\text{hr}$ $= 9,684 \text{ m}^3/\text{day}$ $A = Q/V_c$ $= 6.8 \text{ m}^2$	$V_c = 16.57 \text{ mm/s}$ $= 1,431 \text{ m/day}$ $Q = 744 \text{ m}^3/\text{hr}$ $= 17,857 \text{ m}^3/\text{day}$ $A = Q/V_c$ $= 12.5 \text{ m}^2$	$V_c = 16.57 \text{ mm/s}$ $= 1,431 \text{ m/day}$ $Q = 1,788 \text{ m}^3/\text{hr}$ $= 42,917 \text{ m}^3/\text{day}$ $A = Q/V_c$ $= 30.0 \text{ m}^2$
Sizing of Settling Tank Length / Width = 2 $L = 2W$ $A = L * W = 2W^2$ $W = (A/2)^{0.5}$ $= 1.84$ $= 2 \text{ m}$ $L = 4 \text{ m}$	Sizing of Settling Tank Length / Width = 2 $L = 2W$ $A = L * W = 2W^2$ $W = (A/2)^{0.5}$ $= 2.50$ $= 3 \text{ m}$ $L = 6 \text{ m}$	Sizing of Settling Tank Length / Width = 2 $L = 2W$ $A = L * W = 2W^2$ $W = (A/2)^{0.5}$ $= 3.87$ $= 4 \text{ m}$ $L = 8 \text{ m}$