SampleID : QaaCW01
Location : El Qaa Plain
Site : PZ-8
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Na-Ca-Cl

Sum of Anions (meq/l) : 30.53
Sum of Cations (meq/l) : 52.10
Balance: : 26.1%

Total dissolved solids : 82.6 meq/l 2234.7 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 15.89	79.45	44.49	794.5
Permanent hardness	: 15.5	77.48	43.39	774.8
Temporary hardness	: 0.39	1.97	1.10	19.7
Alkalinity	: 0.39	1.97	1.10	19.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	805.0	35.015	35.015	42.376
K +	12.48	0.319	0.319	0.386
Ca++	176.0	4.391	8.782	10.628
Mg++	86.4	3.554	7.108	8.602
Cl-	961.4	27.118	27.118	32.819
SO4--	145.0	1.51	3.019	3.654
HCO3-	24.0	0.393	0.393	0.476

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.037	1.236	0.319	0.194
Ca/SO4	1.214	2.909	0.152	0.364
Na/Cl	0.837	1.291	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	44.746	0.7649
Dolomite (CaMg(CO3)2):	654.309	3.554
Anhydrite (CaSO4) :	205.599	1.51

SampleID	:	QaaCW02
Location	:	El Qaa Plain
Site	:	QAA10
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl
Sum of Anions (meq/l)	:	14.57
Sum of Cations (meq/l)	:	22.53
Balance:	:	21.4%
Total dissolved solids	:	37.1 meq/l 1074.3 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	7.95	39.75	22.26	397.5
Permanent hardness	:	5.26	26.31	14.73	263.1
Temporary hardness	:	2.69	13.44	7.53	134.4
Alkalinity	:	2.69	13.44	7.53	134.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	326.37	14.196	14.196	38.256
K +	12.48	0.319	0.319	0.86
Ca++	97.6	2.435	4.87	13.124
Mg++	37.44	1.54	3.08	8.3
Cl-	384.5	10.845	10.845	29.226
SO4--	50.0	0.521	1.041	2.805
HCO3-	164.0	2.688	2.688	7.244

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.607	1.581	0.319	0.194
Ca/SO4	1.952	4.678	0.152	0.364
Na/Cl	0.849	1.309	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	17.896	0.3059
Carbonate (CaCo3)	:	37.487	0.3749
Dolomite (CaMg(CO3)2)	:	283.534	1.54
Anhydrite (CaSO4)	:	70.896	0.521

SampleID	:	QaaCW03
Location	:	El Qaa Plain
Site	:	QAA8
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-SO4-Cl
Sum of Anions (meq/l)	:	9.31
Sum of Cations (meq/l)	:	15.72
Balance:	:	25.6%
Total dissolved solids	:	25.0 meq/l 731.9 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	7.95	39.75	22.26	397.5
Permanent hardness	:	7.46	37.29	20.88	372.9
Temporary hardness	:	0.49	2.46	1.38	24.6
Alkalinity	:	0.49	2.46	1.38	24.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	172.5	7.503	7.503	29.976
K +	6.63	0.17	0.17	0.679
Ca++	95.2	2.375	4.75	18.977
Mg++	38.88	1.599	3.199	12.781
Cl-	105.8	2.984	2.984	11.922
SO4--	280.0	2.915	5.83	23.292
HCO3-	30.0	0.492	0.492	1.966

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.449	1.485	0.319	0.194
Ca/SO4	0.34	0.815	0.152	0.364
Na/Cl	1.63	2.514	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4.924	0.0842
Anhydrite (CaSO4)	:	397.018	2.915

SampleID	:	QaaCW04
Location	:	El Qaa Plain
Site	:	QAA12
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-Cl-SO4
Sum of Anions (meq/l)	:	5.94
Sum of Cations (meq/l)	:	10.59
Balance:	:	28.2%
Total dissolved solids	:	16.5 meq/l 486.2 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	4.97	24.86	13.92	248.6
Permanent hardness	:	3.5	17.48	9.79	174.8
Temporary hardness	:	1.48	7.38	4.13	73.8
Alkalinity	:	1.48	7.38	4.13	73.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	128.8	5.602	5.602	33.891
K +	0.66	0.017	0.017	0.103
Ca++	66.4	1.657	3.313	20.043
Mg++	20.16	0.829	1.659	10.037
Cl-	96.1	2.711	2.711	16.401
SO4--	84.0	0.874	1.749	10.581
HCO3-	90.0	1.475	1.475	8.924

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.294	1.998	0.319	0.194
Ca/SO4	0.79	1.894	0.152	0.364
Na/Cl	1.34	2.067	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4.473	0.0765
Dolomite (CaMg(CO3)2):		152.672	0.829
Anhydrite (CaSO4)	:	119.106	0.874

SampleID	:	QaaCW05
Location	:	El Qaa Plain
Site	:	QAA15
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Mg-HCO3-Cl-SO4
Sum of Anions (meq/l)	:	3.98
Sum of Cations (meq/l)	:	7.49
Balance:	:	30.6%
Total dissolved solids	:	11.5 meq/l 345.8 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	4.78	23.89	13.38	238.9
Permanent hardness	:	3.2	16.02	8.97	160.2
Temporary hardness	:	1.57	7.87	4.41	78.7
Alkalinity	:	1.57	7.87	4.41	78.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	60.95	2.651	2.651	23.105
K +	2.46	0.063	0.063	0.549
Ca++	71.2	1.776	3.553	30.967
Mg++	14.88	0.612	1.224	10.668
Cl-	43.3	1.221	1.221	10.642
SO4--	57.0	0.593	1.187	10.346
HCO3-	96.0	1.574	1.574	13.719

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.785	2.902	0.319	0.194
Ca/SO4	1.249	2.994	0.152	0.364
Na/Cl	1.408	2.171	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2.015	0.0344
Carbonate (CaCo3)	:	57.152	0.5715
Dolomite (CaMg(CO3)2)	:	112.686	0.612
Anhydrite (CaSO4)	:	80.822	0.593

SampleID	:	QaaCW06
Location	:	El Qaa Plain
Site	:	QAA23
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-HCO3-Cl-SO4
Sum of Anions (meq/l)	:	4.08
Sum of Cations (meq/l)	:	7.22
Balance:	:	27.7%

Total dissolved solids : 11.3 meq/l 344.9 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 3.66	18.29	10.24	182.9
Permanent hardness	: 2.12	10.59	5.93	105.9
Temporary hardness	: 1.54	7.71	4.32	77.1
Alkalinity	: 1.54	7.71	4.32	77.1

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	80.5	3.502	3.502	30.987
K +	2.18	0.056	0.056	0.496
Ca++	47.2	1.178	2.355	20.838
Mg++	15.84	0.652	1.303	11.529
Cl-	48.1	1.357	1.357	12.007
SO4--	57.0	0.593	1.187	10.503
HCO3-	94.0	1.541	1.541	13.635

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.98	1.807	0.319	0.194
Ca/SO4	0.828	1.985	0.152	0.364
Na/Cl	1.674	2.581	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2.239	0.0383
Dolomite (CaMg(CO3)2)	:	119.957	0.652
Anhydrite (CaSO4)	:	80.822	0.593

SampleID : QaaCW07
Location : El Qaa Plain
Site : QAA21
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Ca-Na-Mg-Cl

Sum of Anions (meq/l) : 4.71
Sum of Cations (meq/l) : 14.26
Balance: : 50.3%

Total dissolved solids : 19.0 meq/l 498.5 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 9.14	45.72	25.60	457.2
Permanent hardness	: 7.54	37.69	21.10	376.9
Temporary hardness	: 1.61	8.03	4.50	80.3
Alkalinity	: 1.61	8.03	4.50	80.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	115.0	5.002	5.002	26.369
K +	4.29	0.11	0.11	0.58
Ca++	113.6	2.834	5.669	29.885
Mg++	42.24	1.738	3.475	18.319
Cl-	67.3	1.898	1.898	10.006
SO4--	58.0	0.604	1.208	6.368
HCO3-	98.0	1.606	1.606	8.466

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.689	1.631	0.319	0.194
Ca/SO4	1.959	4.694	0.152	0.364
Na/Cl	1.709	2.635	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	3.132	0.0535
Carbonate (CaCo3) :	49.345	0.4935
Dolomite (CaMg(CO3)2):	319.884	1.738
Anhydrite (CaSO4) :	82.24	0.604

SampleID	:	QaaCW08
Location	:	El Qaa Plain
Site	:	QAA29
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Mg-HCO3-Cl
Sum of Anions (meq/l)	:	4.00
Sum of Cations (meq/l)	:	8.52
Balance:	:	36.1%
Total dissolved solids	:	12.5 meq/l 357.2 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	5.97	29.83	16.70	298.3
Permanent hardness	:	4.49	22.45	12.57	224.5
Temporary hardness	:	1.48	7.38	4.13	73.8
Alkalinity	:	1.48	7.38	4.13	73.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	57.5	2.501	2.501	19.974
K +	2.18	0.056	0.056	0.447
Ca++	78.4	1.956	3.912	31.243
Mg++	24.96	1.027	2.053	16.396
Cl-	48.1	1.357	1.357	10.838
SO4--	56.0	0.583	1.166	9.312
HCO3-	90.0	1.475	1.475	11.78

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.141	1.905	0.319	0.194
Ca/SO4	1.4	3.355	0.152	0.364
Na/Cl	1.195	1.843	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2.239	0.0383
Carbonate (CaCo3)	:	34.67	0.3467
Dolomite (CaMg(CO3)2)	:	189.022	1.027
Anhydrite (CaSO4)	:	79.404	0.583

SampleID	:	QaaCW09
Location	:	El Qaa Plain
Site	:	Abu Kalam
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl
Sum of Anions (meq/l)	:	22.10
Sum of Cations (meq/l)	:	35.29
Balance:	:	23.0%
Total dissolved solids	:	57.4 meq/l 1589.3 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	11.52	57.58	32.25	575.8
Permanent hardness	:	10.3	51.52	28.85	515.2
Temporary hardness	:	1.21	6.07	3.40	60.7
Alkalinity	:	1.21	6.07	3.40	60.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	543.95	23.66	23.66	41.226
K +	4.29	0.11	0.11	0.192
Ca++	120.0	2.994	5.988	10.434
Mg++	67.2	2.764	5.529	9.634
Cl-	629.7	17.762	17.762	30.949
SO4--	150.0	1.562	3.123	5.442
HCO3-	74.0	1.213	1.213	2.114

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.786	1.083	0.319	0.194
Ca/SO4	0.8	1.917	0.152	0.364
Na/Cl	0.864	1.332	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	29.308	0.501
Dolomite (CaMg(CO3)2):		508.907	2.764
Anhydrite (CaSO4)	:	212.688	1.562

SampleID : QaaDW01
Location : El Qaa Plain
Site : M Abu Salem
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Na-Ca-Cl

Sum of Anions (meq/l) : 24.98
Sum of Cations (meq/l) : 45.75
Balance: : 29.4%

Total dissolved solids : 70.7 meq/l 1953.5 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 17.1	85.51	47.88	855.1
Permanent hardness	: 15.79	78.95	44.21	789.5
Temporary hardness	: 1.31	6.56	3.67	65.6
Alkalinity	: 1.31	6.56	3.67	65.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	652.74	28.392	28.392	40.146
K +	9.83	0.251	0.251	0.355
Ca++	224.0	5.589	11.178	15.806
Mg++	72.0	2.962	5.923	8.375
Cl-	624.9	17.626	17.626	24.923
SO4--	290.0	3.019	6.038	8.538
HCO3-	80.0	1.311	1.311	1.854

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	3.111	1.887	0.319	0.194
Ca/SO4	0.772	1.851	0.152	0.364
Na/Cl	1.045	1.611	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	29.084	0.4972
Dolomite (CaMg(CO3)2):	545.257	2.962
Anhydrite (CaSO4) :	411.198	3.019

SampleID	:	QaaDW02
Location	:	El Qaa Plain
Site	:	El Hag Sobahe
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-SO4-Cl

Sum of Anions (meq/l)	:	15.41
Sum of Cations (meq/l)	:	18.47
Balance:	:	9.0%

Total dissolved solids	:	33.9 meq/l	1078.7 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	10.38	51.90	29.07	519.0
Permanent hardness	:	8.77	43.87	24.57	438.7
Temporary hardness	:	1.61	8.03	4.50	80.3
Alkalinity	:	1.61	8.03	4.50	80.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	184.0	8.003	8.003	23.623
K +	3.32	0.085	0.085	0.251
Ca++	119.2	2.974	5.948	17.557
Mg++	53.88	2.216	4.433	13.085
Cl-	120.2	3.39	3.39	10.006
SO4--	500.0	5.205	10.411	30.73
HCO3-	98.0	1.606	1.606	4.74

Ratios	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	2.212	1.342	0.319	0.194
Ca/SO4	0.238	0.571	0.152	0.364
Na/Cl	1.531	2.361	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	5.594	0.0956
Anhydrite (CaSO4)	:	708.961	5.205

SampleID : QaaSP01
Location : El Qaa Plain
Site : Hamam Musa
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Na-Ca-Cl-SO4

Sum of Anions (meq/l) : 88.70
Sum of Cations (meq/l) : 95.99
Balance: : 4.0%

Total dissolved solids : 184.7 meq/l 5616.6 mg/l

Hardness	: meq/l	□f	□g	mg/l CaCO3
Total hardness	: 49.84	249.18	139.54	2491.8
Permanent hardness	: 47.97	239.83	134.31	2398.3
Temporary hardness	: 1.87	9.34	5.23	93.4
Alkalinity	: 1.87	9.34	5.23	93.4

(1 □f = 10 mg/l CaCO3/l 1 □g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1035.0	45.02	45.02	24.376
K +	44.46	1.137	1.137	0.616
Ca++	880.0	21.956	43.912	23.776
Mg++	72.0	2.962	5.923	3.207
Cl-	1971.0	55.595	55.595	30.101
SO4--	1500.0	15.616	31.232	16.91
HCO3-	114.0	1.869	1.869	1.012

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	12.222	7.413	0.319	0.194
Ca/SO4	0.587	1.406	0.152	0.364
Na/Cl	0.525	0.81	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2633.645	45.0196
Carbonate (CaCo3)	:	338.183	3.3818
Dolomite (CaMg(CO3)2)	:	545.257	2.962
Anhydrite (CaSO4)	:	2126.884	15.616

SampleID	: QaaSP02
Location	: El Qaa Plain
Site	: W. Hibran
Sampling Date	: Feb1997
Geology	: Sand and G
Watertype	: Ca-Na-Mg-Cl-HCO3

Sum of Anions (meq/l)	: 8.17	
Sum of Cations (meq/l)	: 13.29	
Balance:	: 23.9%	
Total dissolved solids	: 21.5 meq/l	637.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 8.35	41.74	23.38	417.4
Permanent hardness	: 5.5	27.48	15.39	274.8
Temporary hardness	: 2.85	14.26	7.99	142.6
Alkalinity	: 2.85	14.26	7.99	142.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	109.48	4.762	4.762	22.189
K +	7.02	0.18	0.18	0.839
Ca++	104.0	2.595	5.19	24.184
Mg++	38.4	1.58	3.159	14.72
Cl-	144.2	4.067	4.067	18.951
SO4--	60.0	0.625	1.249	5.82
HCO3-	174.0	2.852	2.852	13.289

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	2.708	1.643	0.319	0.194
Ca/SO4	1.733	4.154	0.152	0.364
Na/Cl	0.759	1.171	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	6.711	0.1147
Carbonate (CaCo3) :	39.097	0.391
Dolomite (CaMg(CO3)2):	290.804	1.58
Anhydrite (CaSO4) :	85.075	0.625

SampleID : QaaSP03
Location : El Qaa Plain
Site : W. Mear
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Mg-Ca-SO4-HCO3

Sum of Anions (meq/l) : 9.97
Sum of Cations (meq/l) : 9.11
Balance: : 4.5%

Total dissolved solids : 19.1 meq/l 636.7 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 7.92	39.62	22.19	396.2
Permanent hardness	: 5.63	28.14	15.76	281.4
Temporary hardness	: 2.3	11.48	6.43	114.8
Alkalinity	: 2.3	11.48	6.43	114.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	25.99	1.13	1.13	5.922
K +	2.18	0.056	0.056	0.293
Ca++	48.0	1.198	2.395	12.552
Mg++	67.2	2.764	5.529	28.976
Cl-	43.3	1.221	1.221	6.399
SO4--	310.0	3.227	6.455	33.829
HCO3-	140.0	2.295	2.295	12.028

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.714	0.433	0.319	0.194
Ca/SO4	0.155	0.371	0.152	0.364
Na/Cl	0.6	0.926	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	66.134	1.1305
Anhydrite (CaSO4)	:	439.556	3.227

SampleID	:	QaaSP04
Location	:	El Qaa Plain
Site	:	W. Thman
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Mg-Ca-Na-SO4-HCO3-Cl
Sum of Anions (meq/l)	:	12.46
Sum of Cations (meq/l)	:	14.87
Balance:	:	8.8%
Total dissolved solids	:	27.3 meq/l 862. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	11.04	55.21	30.92	552.1
Permanent hardness	:	8.09	40.46	22.66	404.6
Temporary hardness	:	2.95	14.75	8.26	147.5
Alkalinity	:	2.95	14.75	8.26	147.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	86.25	3.752	3.752	13.73
K +	2.77	0.071	0.071	0.26
Ca++	96.0	2.395	4.79	17.529
Mg++	76.0	3.126	6.253	22.882
Cl-	100.9	2.846	2.846	10.415
SO4--	320.0	3.331	6.663	24.383
HCO3-	180.0	2.95	2.95	10.795

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.263	0.766	0.319	0.194
Ca/SO4	0.3	0.719	0.152	0.364
Na/Cl	0.855	1.318	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4.696	0.0803
Anhydrite (CaSO4)	:	453.735	3.331

SampleID	:	Sheira01
Location	:	Wadi Sheira
Site	:	Sheira-1
Sampling Date	:	Feb1997
Geology	:	Sand Stone
Watertype	:	Ca-Mg-SO4

Sum of Anions (meq/l)	:	19.29
Sum of Cations (meq/l)	:	33.24
Balance:	:	26.6%

Total dissolved solids	:	52.5 meq/l	1474. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	29.79	148.95	83.41	1489.5
Permanent hardness	:	26.97	134.85	75.52	1348.5
Temporary hardness	:	2.82	14.10	7.89	141.0
Alkalinity	:	2.82	14.10	7.89	141.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	73.6	3.201	3.201	6.093
K +	9.36	0.239	0.239	0.455
Ca++	320.0	7.984	15.968	30.394
Mg++	168.0	6.911	13.821	26.307
Cl-	170.6	4.812	4.812	9.159
SO4--	560.0	5.83	11.66	22.194
HCO3-	172.0	2.819	2.819	5.366

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.905	1.155	0.319	0.194
Ca/SO4	0.571	1.369	0.152	0.364
Na/Cl	0.431	0.665	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	187.281	3.2014
Dolomite (CaMg(CO3)2):		1272.267	6.911
Anhydrite (CaSO4)	:	794.037	5.83

SampleID	:	QaaSP05
Location	:	El Qaa Plain
Site	:	W. Isra
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Mg-Ca-Na-SO4-HCO3

Sum of Anions (meq/l)	:	11.56
Sum of Cations (meq/l)	:	12.61
Balance:	:	4.3%

Total dissolved solids	:	24.2 meq/l	786.3 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	9.92	49.58	27.76	495.8
Permanent hardness	:	7.13	35.64	19.96	356.4
Temporary hardness	:	2.79	13.93	7.80	139.3
Alkalinity	:	2.79	13.93	7.80	139.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	58.65	2.551	2.551	10.554
K +	5.59	0.143	0.143	0.592
Ca++	80.0	1.996	3.992	16.516
Mg++	72.0	2.962	5.923	24.505
Cl-	60.1	1.695	1.695	7.013
SO4--	340.0	3.54	7.079	29.287
HCO3-	170.0	2.787	2.787	11.53

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.111	0.674	0.319	0.194
Ca/SO4	0.235	0.564	0.152	0.364
Na/Cl	0.976	1.505	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2.797	0.0478
Anhydrite (CaSO4)	:	482.094	3.54

SampleID	:	Spring01
Location	:	Other Springs
Site	:	Aynn Musa Spring
Sampling Date	:	Feb1997
Geology	:	Sand Stone
Watertype	:	Mg-Ca-Na-SO4-Cl
Sum of Anions (meq/l)	:	43.39
Sum of Cations (meq/l)	:	30.11
Balance:	:	18.1%
Total dissolved solids	:	73.5 meq/l 2421.4 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	19.85	99.24	55.58	992.4
Permanent hardness	:	17.62	88.09	49.33	880.9
Temporary hardness	:	2.23	11.15	6.24	111.5
Alkalinity	:	2.23	11.15	6.24	111.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	218.5	9.504	9.504	12.93
K +	27.3	0.698	0.698	0.95
Ca++	192.0	4.79	9.581	13.035
Mg++	124.8	5.134	10.267	13.968
Cl-	721.1	20.34	20.34	27.673
SO4--	1000.0	10.411	20.821	28.327
HCO3-	136.0	2.229	2.229	3.033

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.538	0.933	0.319	0.194
Ca/SO4	0.192	0.46	0.152	0.364
Na/Cl	0.303	0.467	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	555.992	9.5041
Anhydrite (CaSO4)	:	1417.923	10.411

SampleID	:	Spring02
Location	:	Other Springs
Site	:	Hammam Faraoun Hot Spring
Sampling Date	:	Feb1997
Geology	:	Limestone
Watertype	:	Na-Mg-Ca-Cl-SO4

Sum of Anions (meq/l)	:	196.81	
Sum of Cations (meq/l)	:	201.51	
Balance:	:	1.2%	
Total dissolved solids	:	398.3 meq/l	11558.5 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	119.07	595.36	333.40	5953.6
Permanent hardness	:	116.78	583.88	326.98	5838.8
Temporary hardness	:	2.3	11.48	6.43	114.8
Alkalinity	:	2.3	11.48	6.43	114.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1849.4	80.444	80.444	20.196
K +	78.0	1.995	1.995	0.501
Ca++	1120.0	27.944	55.888	14.031
Mg++	768.0	31.592	63.184	15.863
Cl-	4903.0	138.296	138.296	34.72
SO4--	2700.0	28.109	56.217	14.113
HCO3-	140.0	2.295	2.295	0.576

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.458	0.885	0.319	0.194
Ca/SO4	0.415	0.994	0.152	0.364
Na/Cl	0.377	0.582	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4705.955	80.4437
Anhydrite (CaSO4)	:	3828.392	28.109

SampleID : Spring03
Location : Other Springs
Site : Ain Om Ahmed Spring
Sampling Date : Feb1997
Geology : Granite
Watertype : Ca-Mg-SO4-Cl

Sum of Anions (meq/l) : 78.43
Sum of Cations (meq/l) : 66.49
Balance: : 8.2%

Total dissolved solids : 144.9 meq/l 4765.9 mg/l

Hardness	meq/l	°f	°g	mg/l CaCO3
Total hardness	51.68	258.41	144.71	2584.1
Permanent hardness	47.68	238.41	133.51	2384.1
Temporary hardness	4.0	20.00	11.20	200.0
Alkalinity	4.0	20.00	11.20	200.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	328.44	14.286	14.286	9.858
K +	20.28	0.519	0.519	0.358
Ca++	640.0	15.968	31.936	22.038
Mg++	240.0	9.872	19.745	13.626
Cl-	793.2	22.373	22.373	15.439
SO4--	2500.0	26.026	52.053	35.92
HCO3-	244.0	3.999	3.999	2.76

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.667	1.617	0.319	0.194
Ca/SO4	0.256	0.614	0.152	0.364
Na/Cl	0.414	0.639	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	835.743	14.2862
Anhydrite (CaSO4) :	3544.807	26.026

SampleID	:	Sudr01
Location	:	Rus Sudr
Site	:	A. K. Khamis
Sampling Date	:	Feb1997
Geology	:	Sand and G
Watertype	:	Mg-Ca-SO4-Cl
Sum of Anions (meq/l)	:	73.42
Sum of Cations (meq/l)	:	51.82
Balance:	:	17.2%
Total dissolved solids	:	125.2 meq/l 4093.2 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	39.66	198.31	111.05	1983.1
Permanent hardness	:	37.76	188.80	105.73	1888.0
Temporary hardness	:	1.9	9.51	5.32	95.1
Alkalinity	:	1.9	9.51	5.32	95.1

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO).

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	273.7	11.905	11.905	9.505
K +	10.06	0.257	0.257	0.205
Ca++	320.0	7.984	15.968	12.749
Mg++	288.0	11.847	23.694	18.918
Cl-	985.4	27.795	27.795	22.192
SO4--	2100.0	21.862	43.724	34.911
HCO3-	116.0	1.901	1.901	1.518

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.111	0.674	0.319	0.194
Ca/SO4	0.152	0.365	0.152	0.364
Na/Cl	0.278	0.428	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	696.453	11.9052
Anhydrite (CaSO4)	:	2977.638	21.862

SampleID	:	Sudr02
Location	:	Rus Sudr
Site	:	Ain Abou Ragem
Sampling Date	:	Feb1997
Geology	:	Limestone
Watertype	:	Na-Mg-Ca-Cl-SO4
Sum of Anions (meq/l)	:	88.27
Sum of Cations (meq/l)	:	108.79
Balance:	:	10.4%
Total dissolved solids	:	197.1 meq/l 5697.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	63.51	317.53	177.82	3175.3
Permanent hardness	:	60.79	303.93	170.20	3039.3
Temporary hardness	:	2.72	13.61	7.62	136.1
Alkalinity	:	2.72	13.61	7.62	136.1

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1035.0	45.02	45.02	22.847
K +	10.06	0.257	0.257	0.13
Ca++	600.0	14.97	29.94	15.194
Mg++	408.0	16.783	33.566	17.034
Cl-	1778.0	50.151	50.151	25.45
SO4--	1700.0	17.698	35.396	17.963
HCO3-	166.0	2.721	2.721	1.381

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.471	0.892	0.319	0.194
Ca/SO4	0.353	0.846	0.152	0.364
Na/Cl	0.582	0.898	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2633.645	45.0196
Anhydrite (CaSO4)	:	2410.469	17.698

SampleID	: TalfaDW01
Location	: El Talfa
Site	: Gomaa Khamis
Sampling Date	: Feb1997
Geology	: Sand and G
Watertype	: Mg-Ca-SO4-HCO3

Sum of Anions (meq/l)	: 9.67	
Sum of Cations (meq/l)	: 9.03	
Balance:	: 3.4%	
Total dissolved solids	: 18.7 meq/l	622.4 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 7.92	39.62	22.19	396.2
Permanent hardness	: 5.79	28.96	16.22	289.6
Temporary hardness	: 2.13	10.66	5.97	106.6
Alkalinity	: 2.13	10.66	5.97	106.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	24.84	1.08	1.08	5.773
K +	1.09	0.028	0.028	0.15
Ca++	48.0	1.198	2.395	12.803
Mg++	67.2	2.764	5.529	29.556
Cl-	31.2	0.88	0.88	4.704
SO4--	320.0	3.331	6.663	35.618
HCO3-	130.0	2.131	2.131	11.392

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	0.714	0.433	0.319	0.194
Ca/SO4	0.15	0.359	0.152	0.364
Na/Cl	0.796	1.228	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	1.452	0.0248
Anhydrite (CaSO4) :	453.735	3.331

SampleID	: Watir01
Location	: Wadi Watir
Site	: Furtaga-1
Sampling Date	: Feb1997
Geology	: Sand and G
Watertype	: Mg-Ca-SO4
Sum of Anions (meq/l)	: 19.69
Sum of Cations (meq/l)	: 11.00
Balance:	: 28.3%
Total dissolved solids	: 30.7 meq/l 1150.7 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 8.73	43.65	24.45	436.5
Permanent hardness	: 5.78	28.90	16.18	289.0
Temporary hardness	: 2.95	14.75	8.26	147.5
Alkalinity	: 2.95	14.75	8.26	147.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	46.0	2.001	2.001	6.519
K +	9.36	0.239	0.239	0.779
Ca++	80.0	1.996	3.992	13.006
Mg++	57.6	2.369	4.739	15.439
Cl-	76.9	2.169	2.169	7.066
SO4--	700.0	7.287	14.575	47.485
HCO3-	180.0	2.95	2.95	9.611

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.389	0.842	0.319	0.194
Ca/SO4	0.114	0.274	0.152	0.364
Na/Cl	0.598	0.922	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	117.051	2.0009
Anhydrite (CaSO4) :	992.546	7.287

SampleID : Watir02
Location : Wadi Watir
Site : Saleh Seleem
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Mg-Ca-SO4

Sum of Anions (meq/l) : 21.89
Sum of Cations (meq/l) : 14.05
Balance: : 21.8%

Total dissolved solids : 35.9 meq/l 1284.4 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 11.9	59.49	33.32	594.9
Permanent hardness	: 9.37	46.87	26.25	468.7
Temporary hardness	: 2.52	12.62	7.07	126.2
Alkalinity	: 2.52	12.62	7.07	126.2

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	46.0	2.001	2.001	5.567
K +	5.85	0.15	0.15	0.417
Ca++	96.0	2.395	4.79	13.327
Mg++	86.4	3.554	7.108	19.776
Cl-	96.1	2.711	2.711	7.543
SO4--	800.0	8.328	16.657	46.343
HCO3-	154.0	2.524	2.524	7.022

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.111	0.674	0.319	0.194
Ca/SO4	0.12	0.288	0.152	0.364
Na/Cl	0.479	0.738	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	117.051	2.0009
Anhydrite (CaSO4) :	1134.338	8.328

SampleID : Zaghara01
Location : Wadi Zaghara
Site : Dug Well
Sampling Date : Feb1997
Geology : Sand and G
Watertype : Ca-Mg-SO4

Sum of Anions (meq/l) : 10.74
Sum of Cations (meq/l) : 23.20
Balance: : 36.7%

Total dissolved solids : 33.9 meq/l 908.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 19.85	99.26	55.59	992.6
Permanent hardness	: 17.95	89.75	50.26	897.5
Temporary hardness	: 1.9	9.51	5.32	95.1
Alkalinity	: 1.9	9.51	5.32	95.1

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	75.9	3.301	3.301	9.727
K +	1.64	0.042	0.042	0.124
Ca++	200.0	4.99	9.98	29.408
Mg++	120.0	4.936	9.872	29.09
Cl-	84.1	2.372	2.372	6.99
SO4--	310.0	3.227	6.455	19.021
HCO3-	116.0	1.901	1.901	5.602

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.667	1.011	0.319	0.194
Ca/SO4	0.645	1.546	0.152	0.364
Na/Cl	0.902	1.392	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	3.914	0.0669
Dolomite (CaMg(CO3)2):	908.762	4.936
Anhydrite (CaSO4) :	439.556	3.227

SampleID	: Zalaga01
Location	: Wadi Zalaga
Site	: Ainez Well
Sampling Date	: Feb1997
Geology	: Sand and G
Watertype	: Ca-Mg-SO4

Sum of Anions (meq/l)	: 37.30
Sum of Cations (meq/l)	: 20.19
Balance:	: 29.8%

Total dissolved solids : 57.5 meq/l 2120.2 mg/l

Hardness	: meq/l	□k f	□k g	mg/l CaCO3
Total hardness	: 15.88	79.41	44.47	794.1
Permanent hardness	: 14.01	70.07	39.24	700.7
Temporary hardness	: 1.87	9.34	5.23	93.4
Alkalinity	: 1.87	9.34	5.23	93.4

(1 □k f = 10 mg/l CaCO3/l 1 □k g = 10 mg/l CaO)

Major ion composition

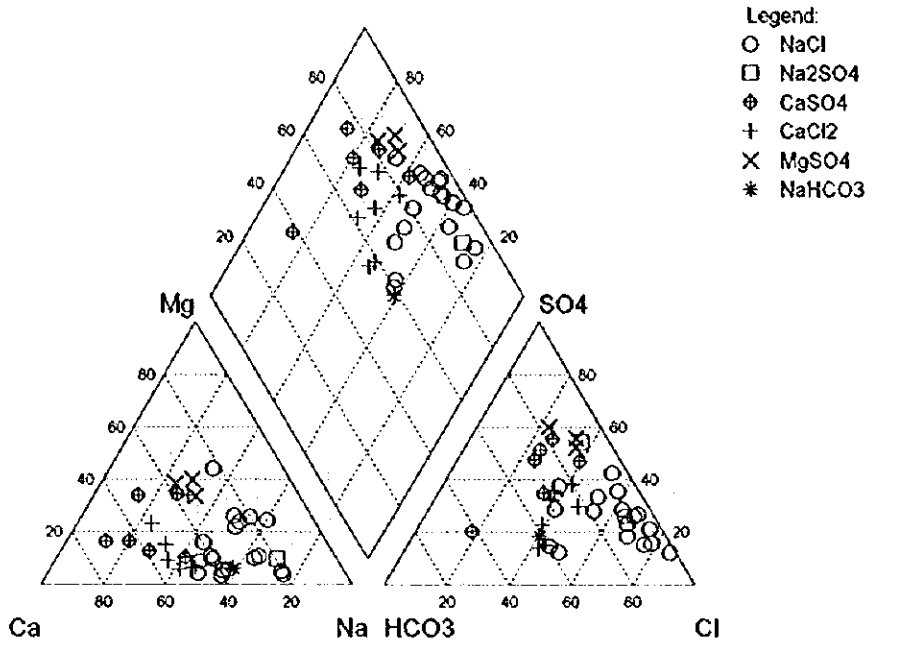
	mg/l	mmol/l	meq/l	meq%
Na+	96.14	4.182	4.182	7.273
K +	5.07	0.13	0.13	0.226
Ca++	160.0	3.992	7.984	13.886
Mg++	96.0	3.949	7.898	13.736
Cl-	149.0	4.203	4.203	7.31
SO4--	1500.0	15.616	31.232	54.319
HCO3-	114.0	1.869	1.869	3.251

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.667	1.011	0.319	0.194
Ca/SO4	0.107	0.256	0.152	0.364
Na/Cl	0.645	0.995	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	244.636	4.1818
Anhydrite (CaSO4)	:	2126.884	15.616

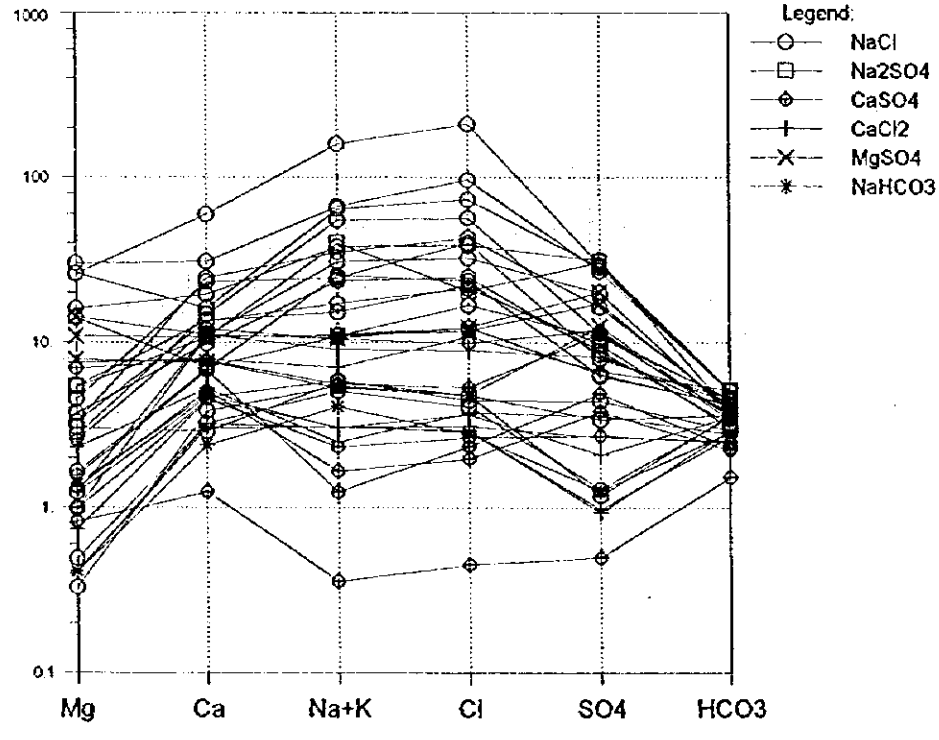
2.1.4 Piper Diagram and Schoeller Graph of Major Water Points (as of August 97)

Piper Diagram of Major Water Points (as of August 97)



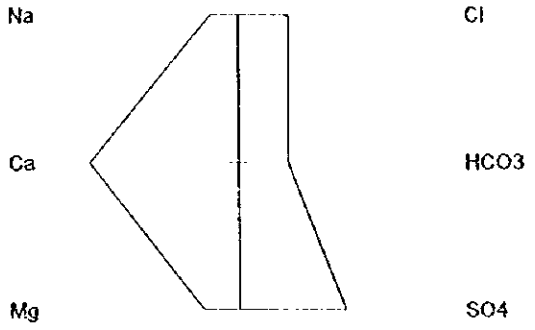
Schoeller Graf of Major Water Points (as of August 97)

Concentration (meq/l)

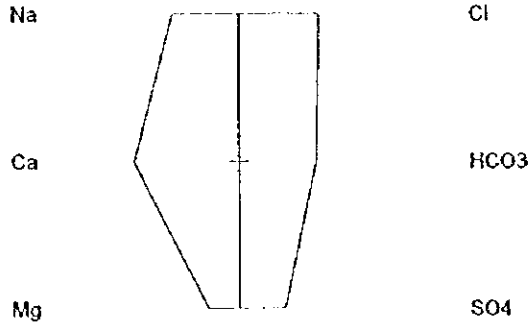


2.1.5 Stiff Diagrams of Major Water Points (as of August 97)

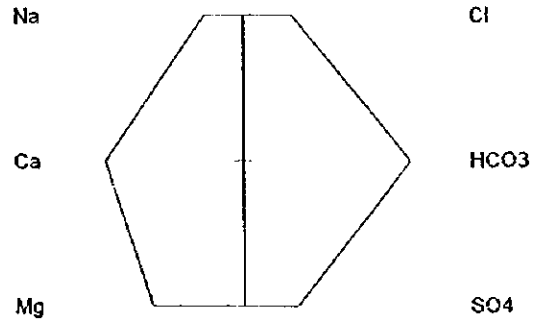
St. Catherine Haroun Well 68



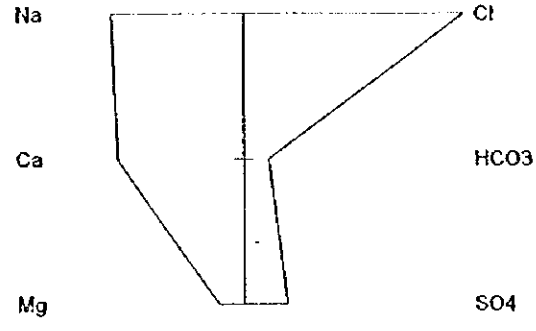
St. Catherine Soyara 1 69



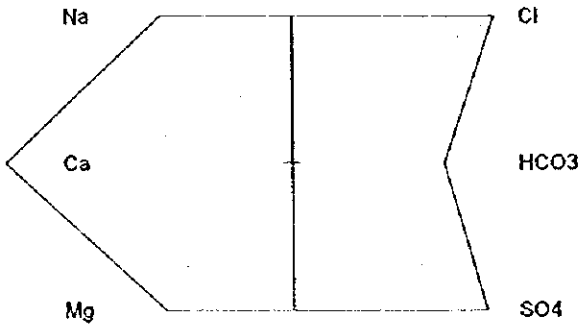
St. Catherine El Rabba Spring 70



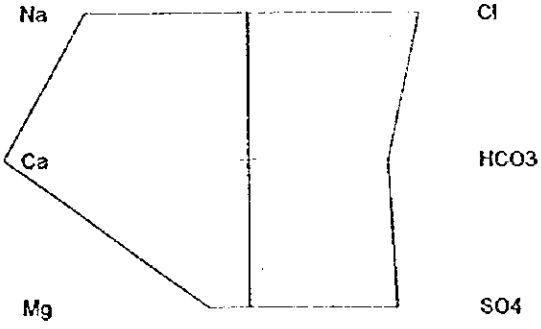
Wadi Dahab Reservoir Tank 77



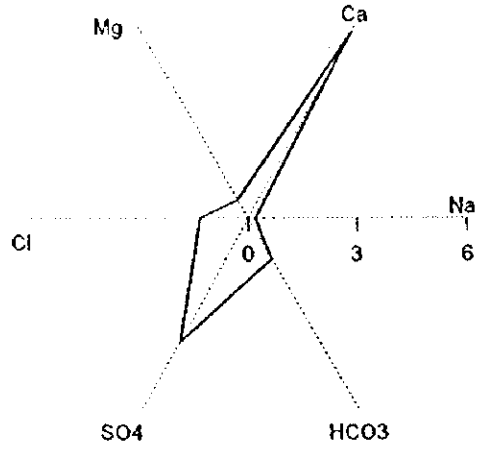
Wadi Feiran M. Salem 1 65



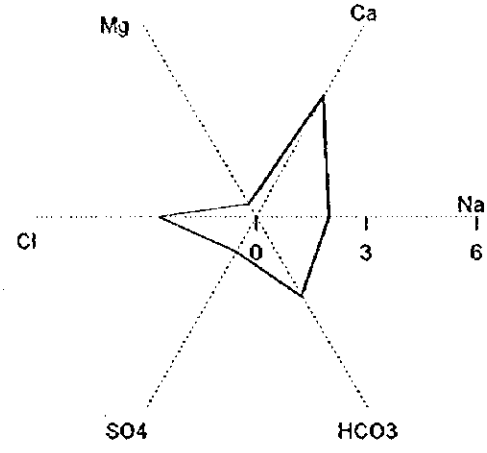
Wadi Feiran Refaay 66



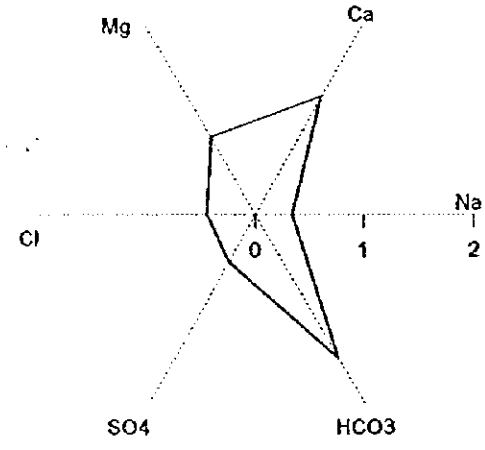
St. Catherine Haroun Well 68



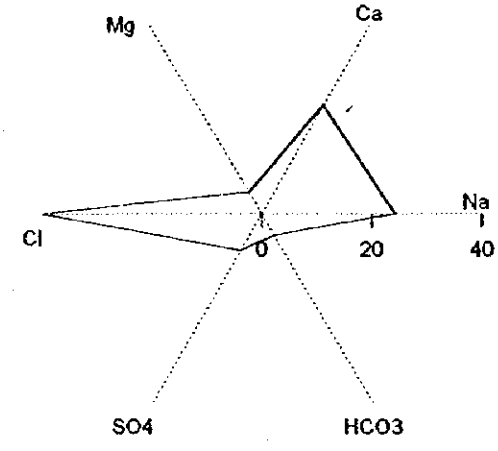
St. Catherine Soyara 1 69



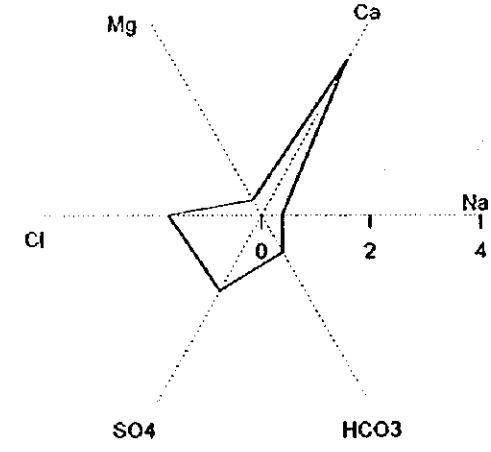
St. Catherine El Rabba Spring 70



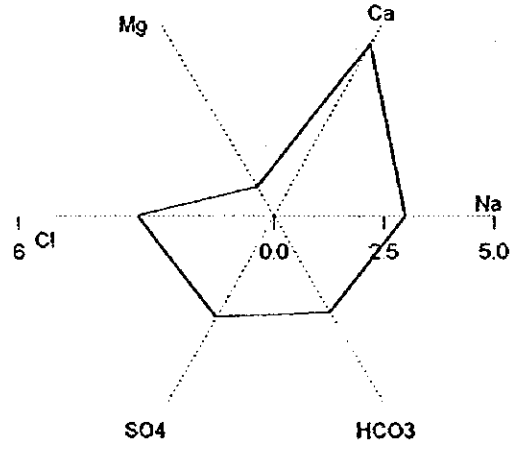
Wadi Dahab Reservoir Tank 77



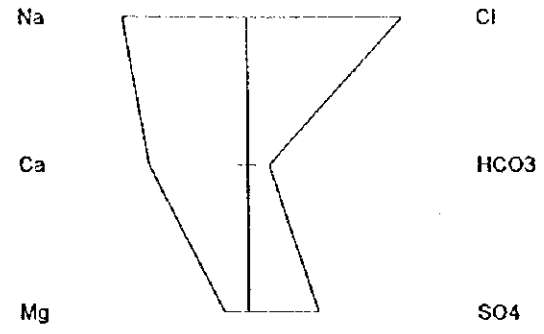
Wadi Feiran M. Salem 1 65



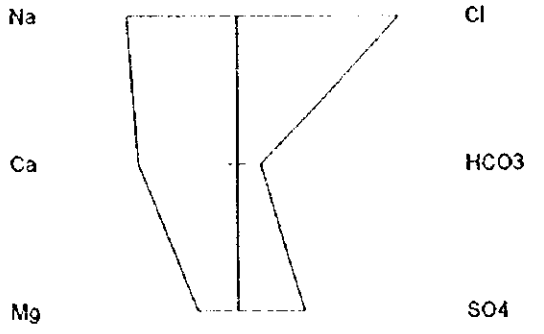
Wadi Feiran Refaay 66



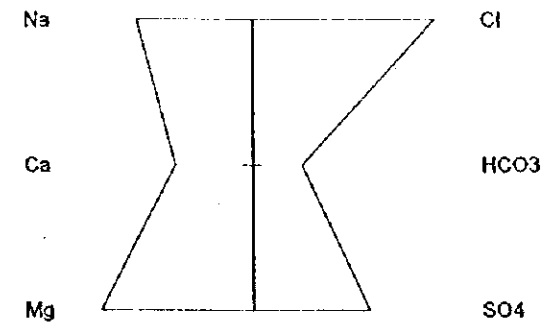
El Malha Abd Allah Seleman Well (1) 81



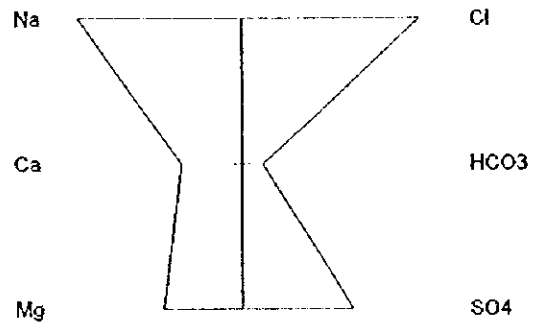
El Malha Abd Allah Seleman Well (2) 82



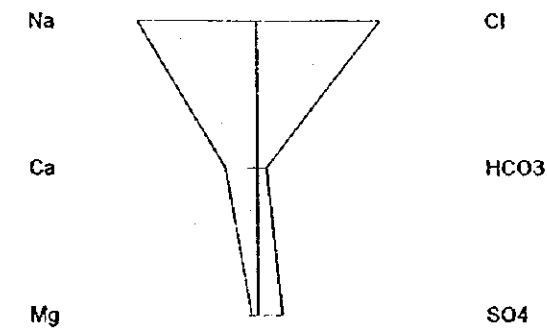
Nuweiba Coastal Plain E. Hemyed 74



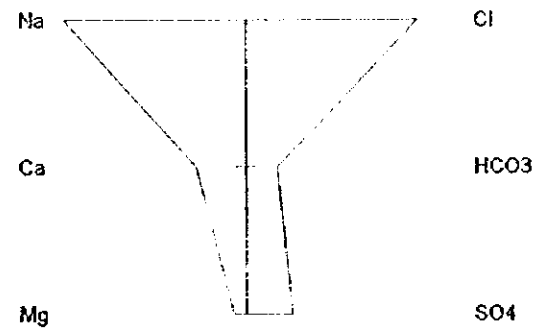
Nuweiba Coastal Plain A. A. Hemad 75



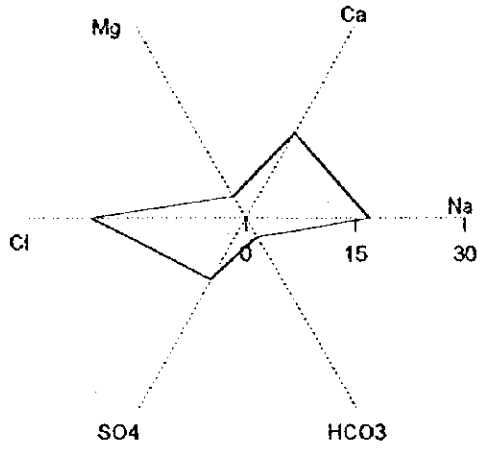
El Qaa Plain PZ-8 49



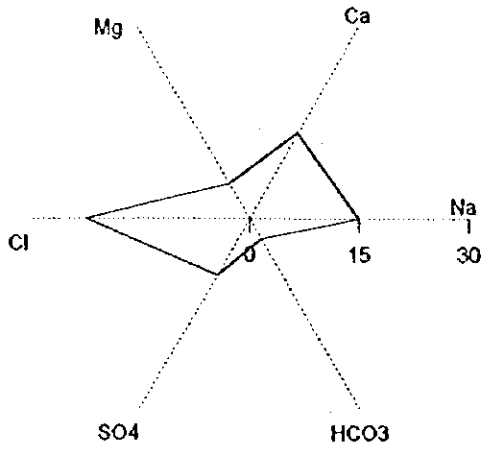
El Qaa Plain QAA10 50



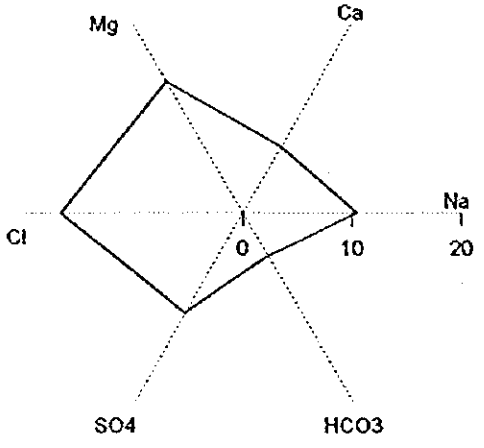
El Malha Abd Allah Seleman Well (1) 81



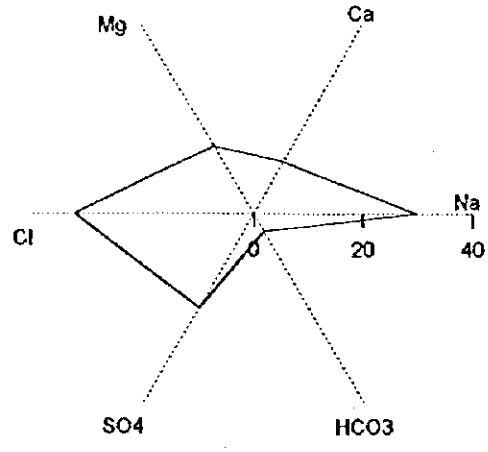
El Malha Abd Allah Seleman Well (2) 82



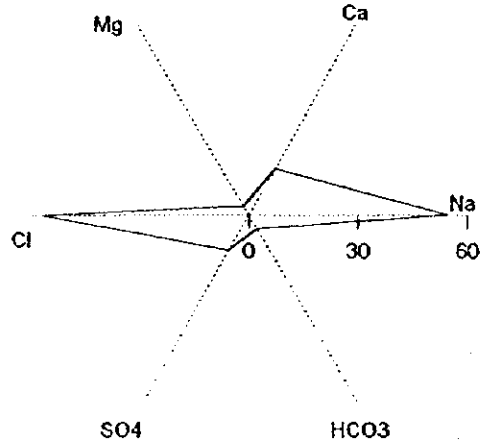
Nuweiba Coastal Plain E. Hemyed 74



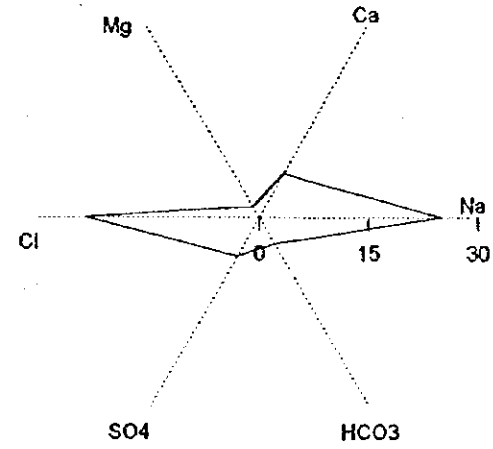
Nuweiba Coastal Plain A. A. Hemad 75



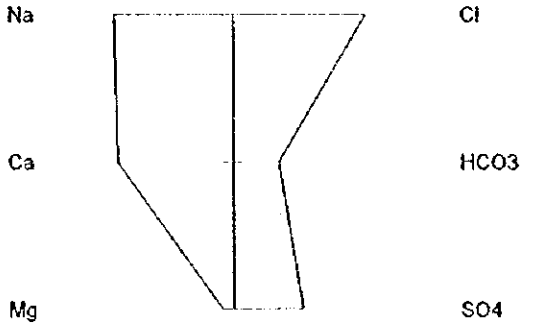
El Qaa Plain PZ-8 49



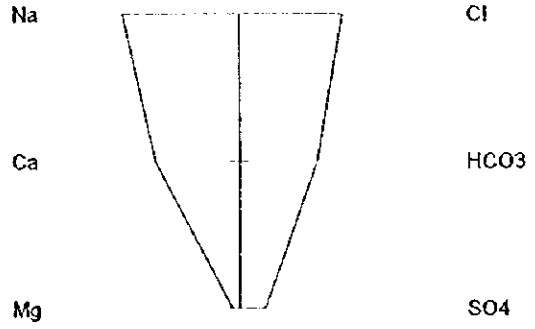
El Qaa Plain QAA10 50



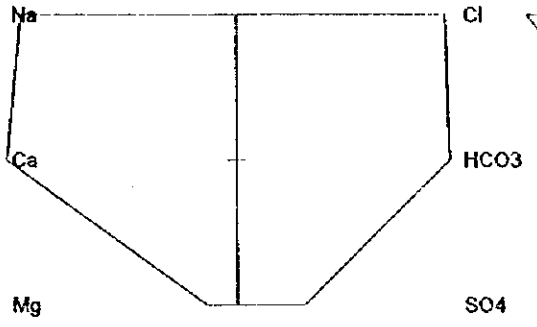
El Qaa Plain QAA8 51



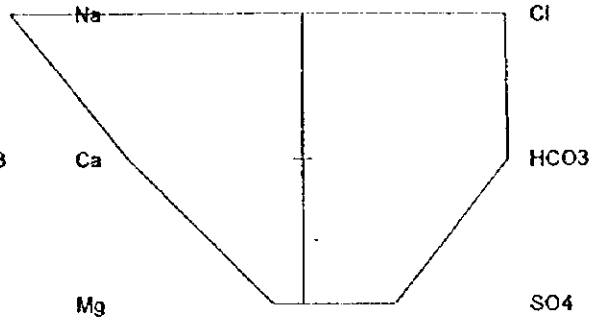
El Qaa Plain QAA12 52



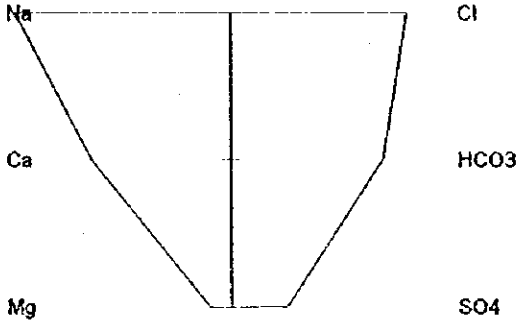
El Qaa Plain QAA15 53



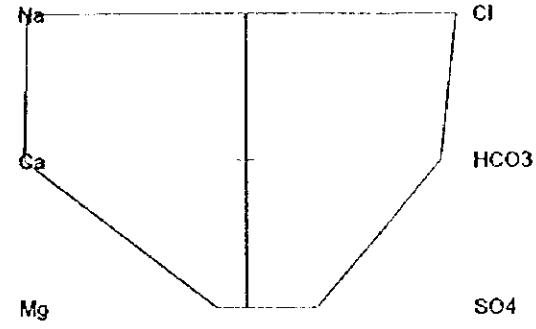
El Qaa Plain QAA23 54



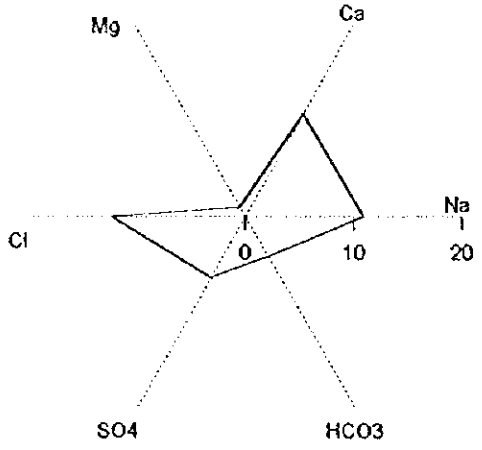
El Qaa Plain QAA21 55



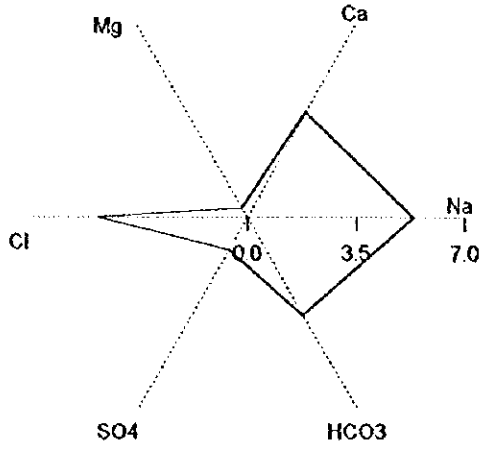
El Qaa Plain QAA29 56



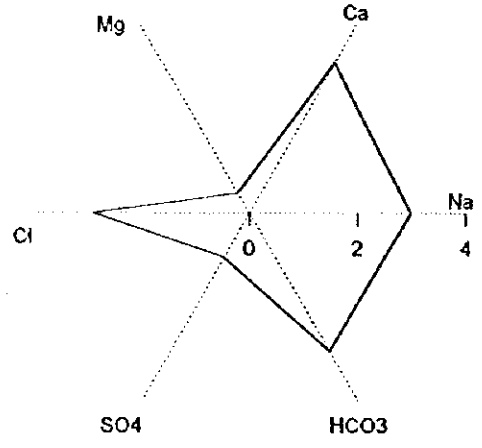
El Qaa Plain QAA8 51



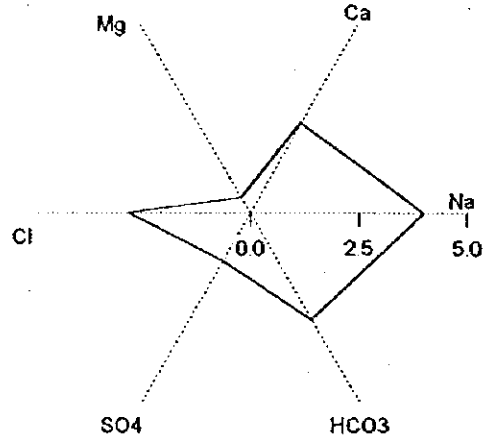
El Qaa Plain QAA12 52



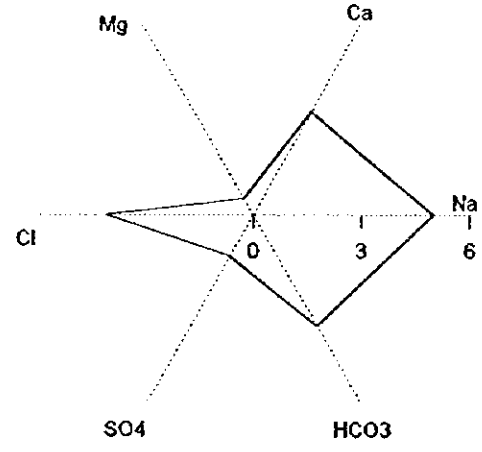
El Qaa Plain QAA15 53



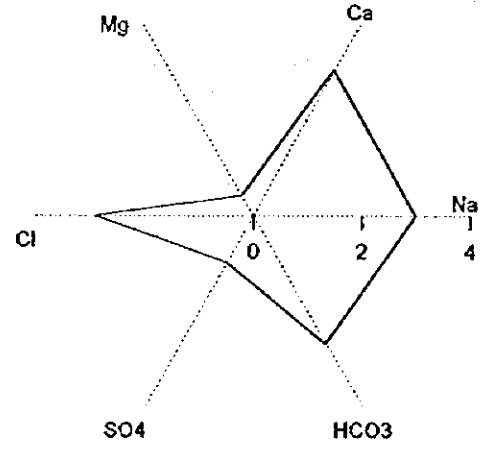
El Qaa Plain QAA23 54



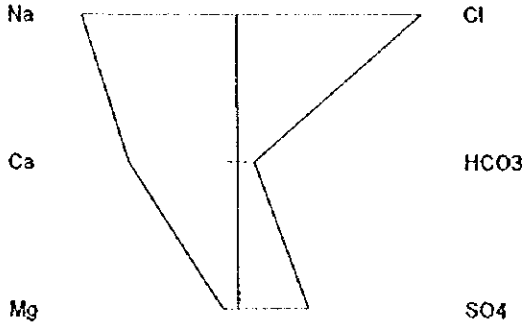
El Qaa Plain QAA21 55



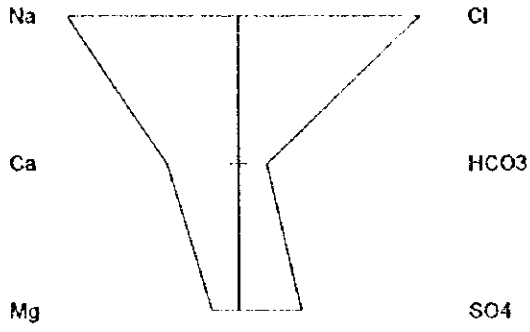
El Qaa Plain QAA29 56



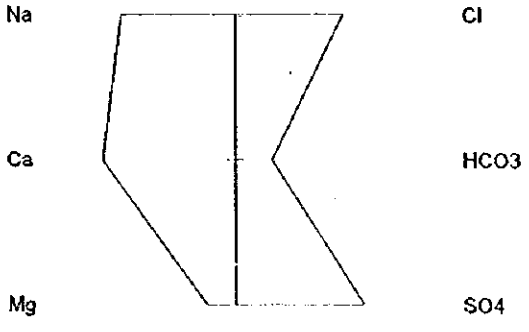
El Qaa Plain Abu Kalam 57



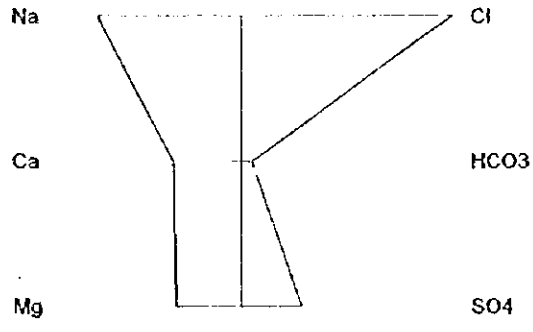
El Qaa Plain M Abu Salem 58



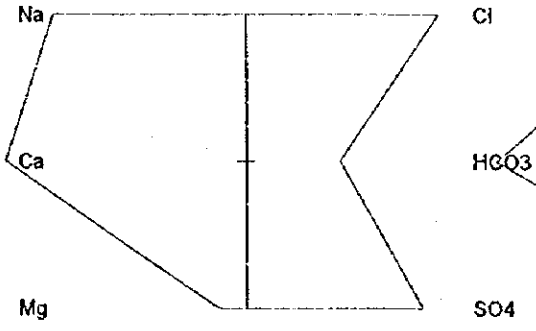
El Qaa Plain El Hag Sobahe 59



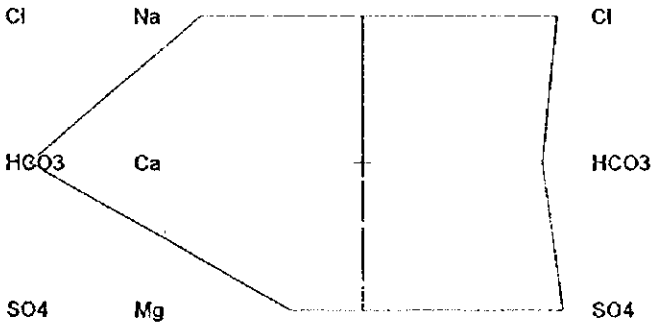
El Qaa Plain Hamam Musa 60



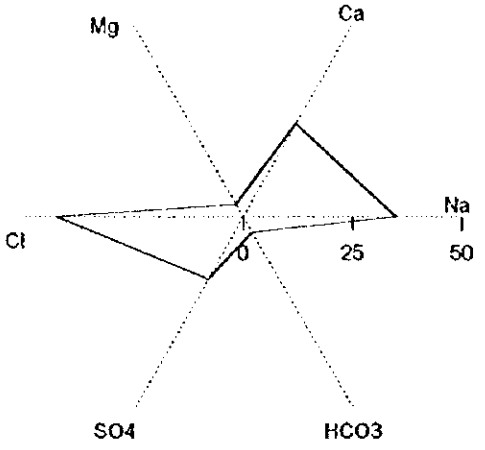
El Qaa Plain W. Hibran 61



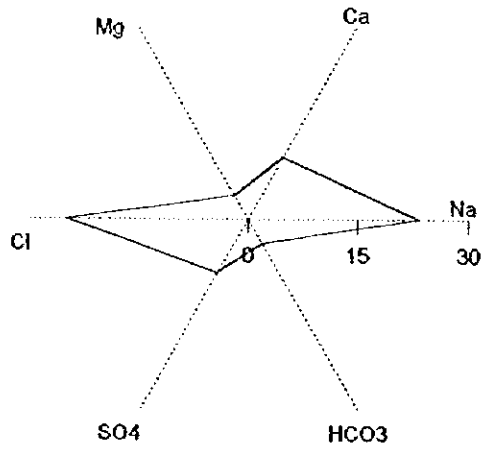
El Qaa Plain W. Mear 62



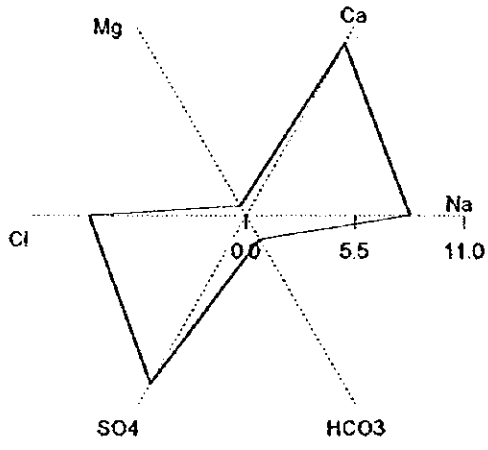
El Qaa Plain Abu Kalam 57



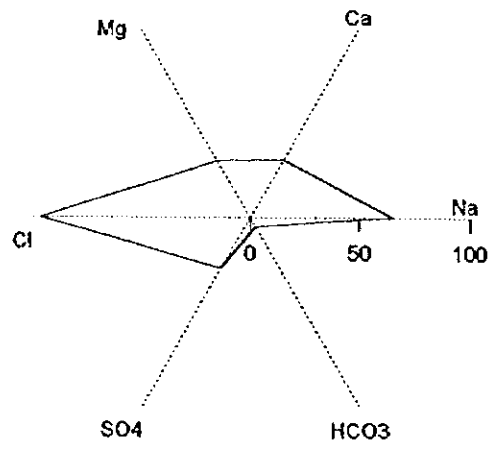
El Qaa Plain M Abu Salem 58



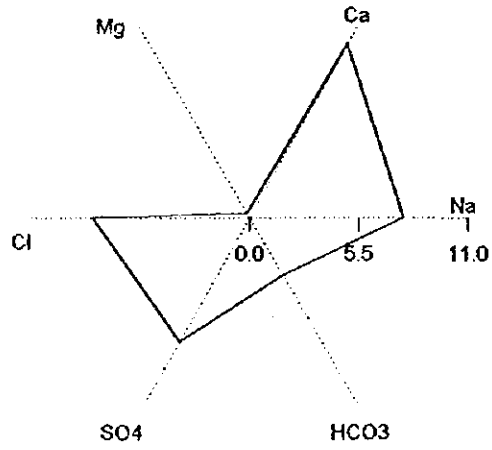
El Qaa Plain El Hag Sobahe 59



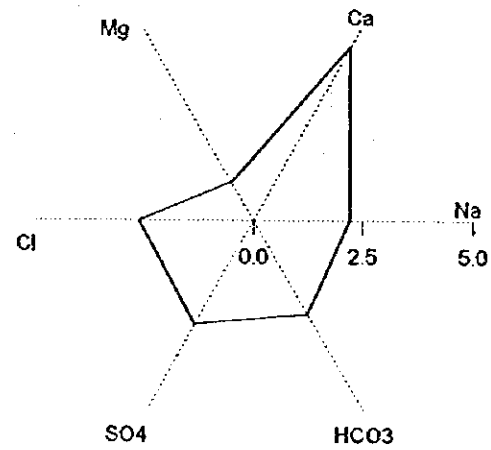
El Qaa Plain Hamam Musa 60



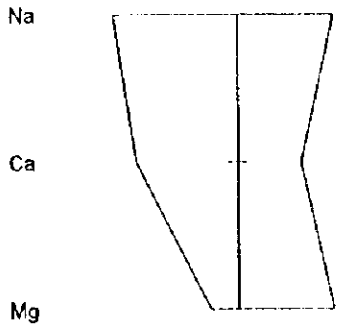
El Qaa Plain W. Hibran 61



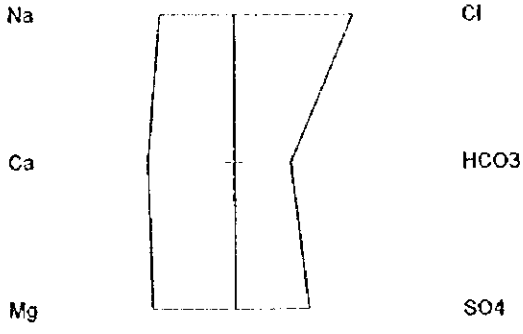
El Qaa Plain W. Mear 62



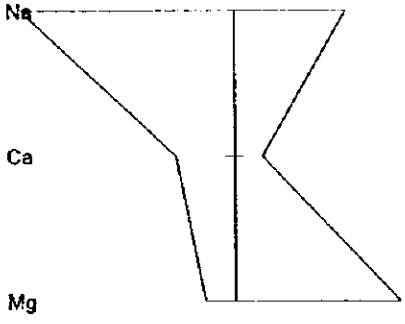
El Qaa Plain W. Esra 64



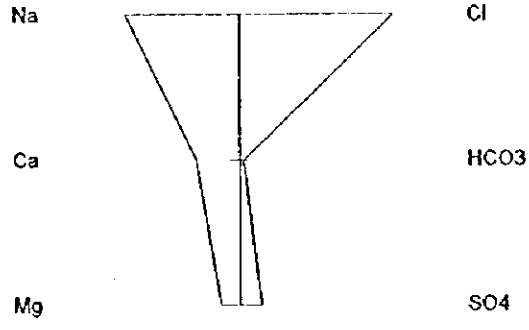
Wadi Sheira Sheira-1 78



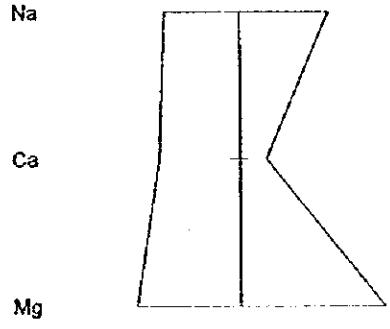
Other Springs Aynn Musa Spring 83



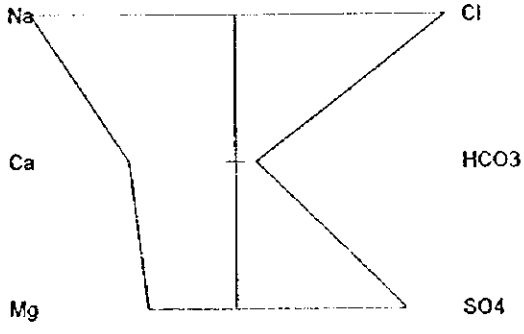
Other Springs Hammam Faraoun Hot Spring 84



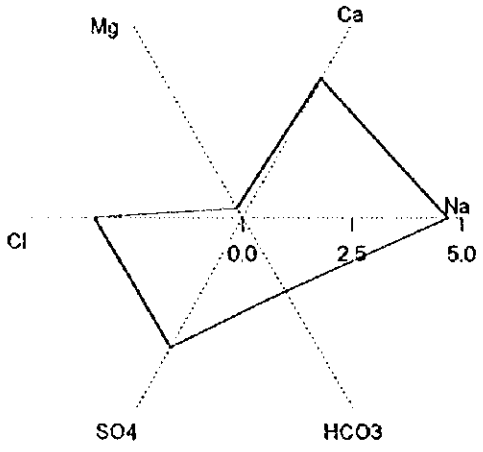
Other Springs Ain Om Ahmed Spring 85



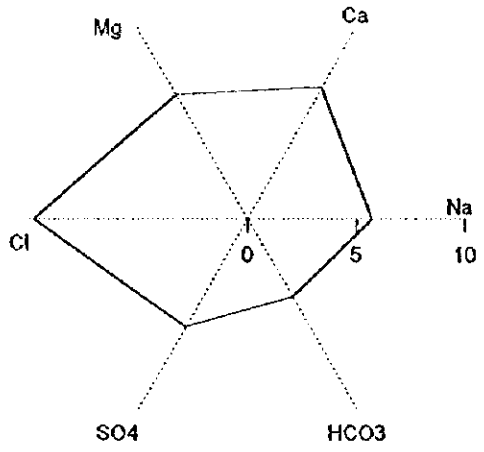
Rus Sudr A. K. Khamis 79



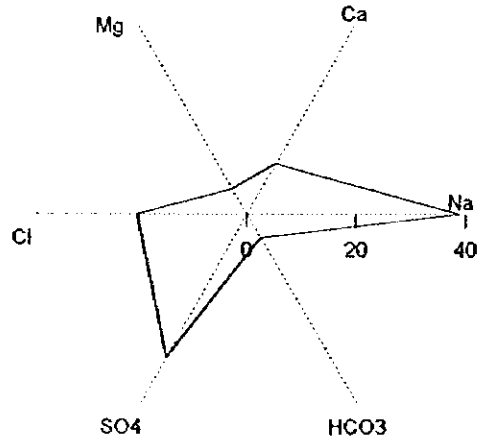
El Qaa Plain W. Esra 64



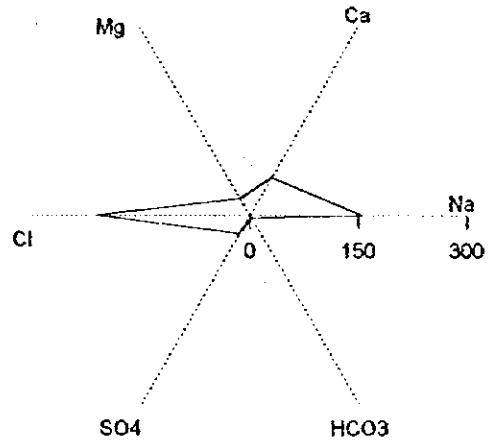
Wadi Sheira Sheira-1 78



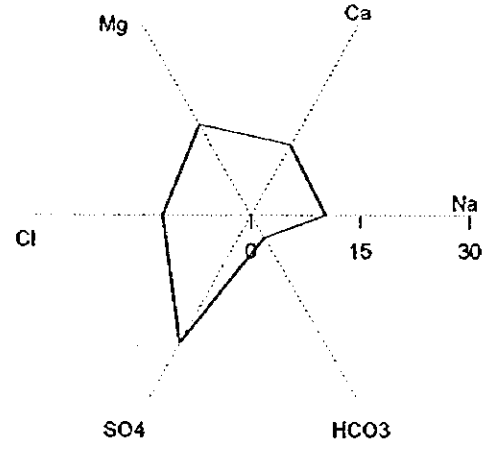
Other Springs Aynn Musa Spring 83



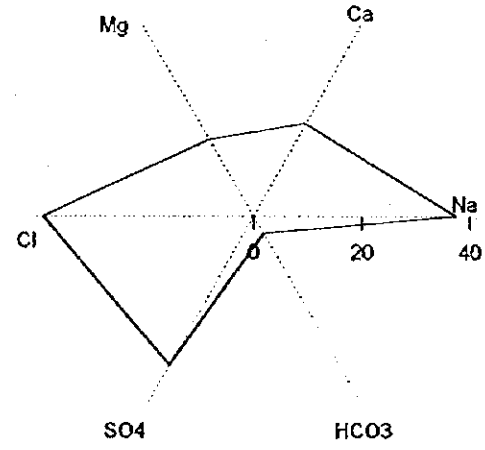
Other Springs Hammam Faraoun Hot Spring 84



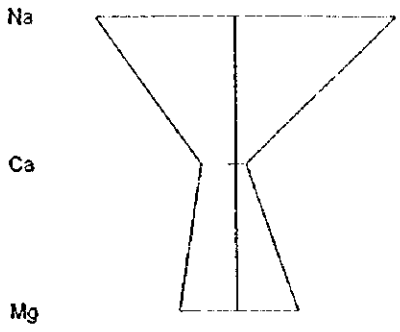
Other Springs Ain Om Ahmed Spring 85



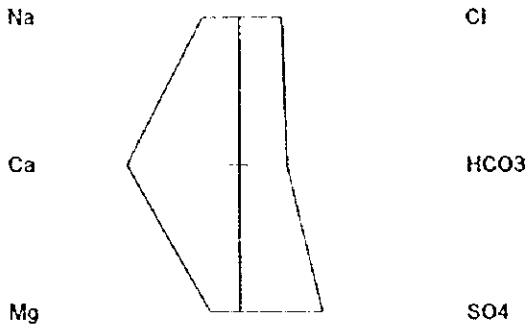
Rus Sudr A. K. Khamis 79



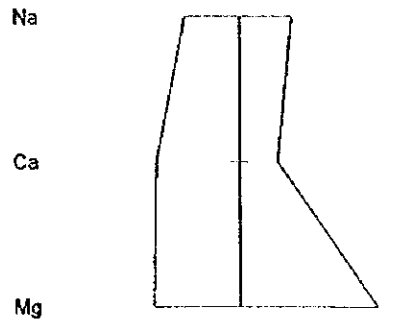
Rus Sudr Ain Abou Ragem 80



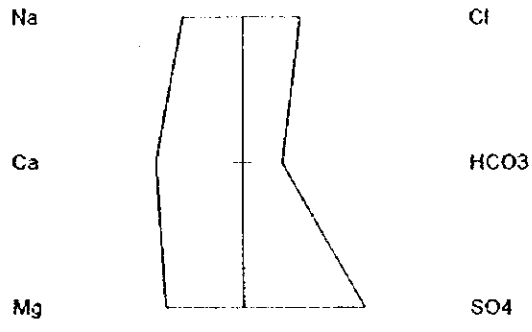
El Talfa Gomaa Khamis 67



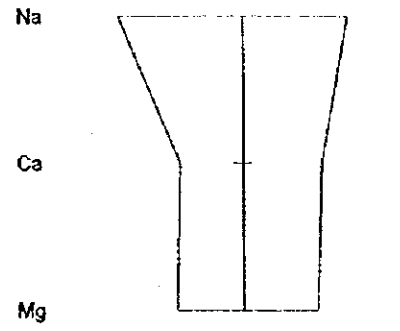
Wadi Watir Furtaga-1 71



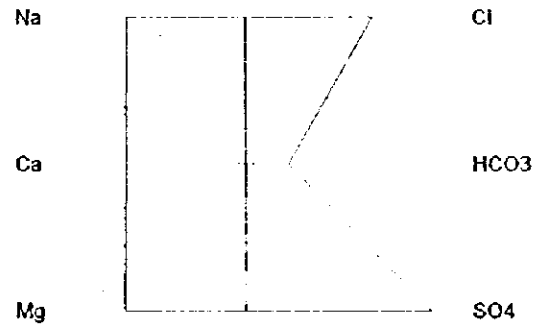
Wadi Watir Saleh Seleem 72



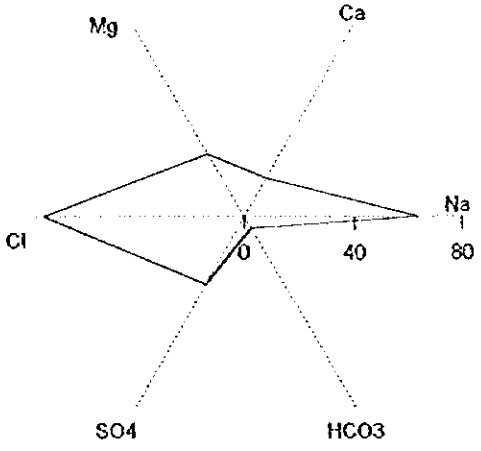
Wadi Zaghara Dug Well 76



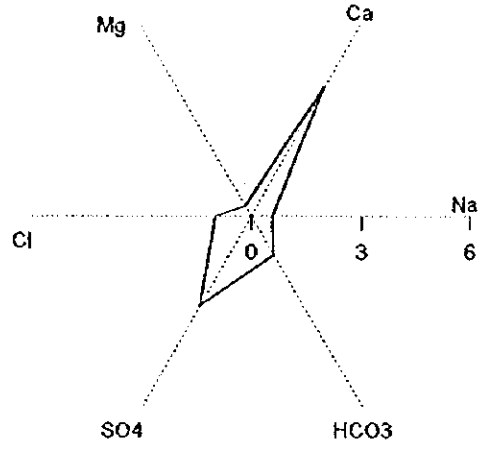
Wadi Zalaga Ainez Well 73



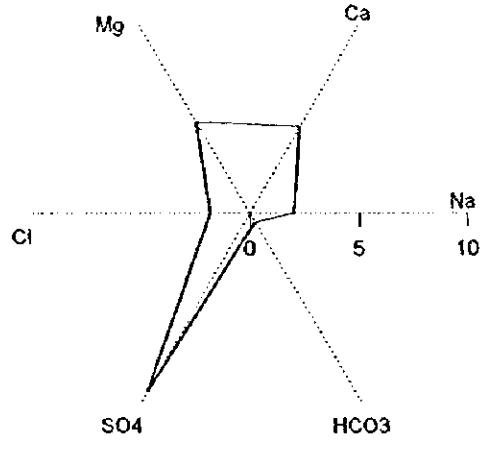
Rus Sudr Ain Abou Ragem 80



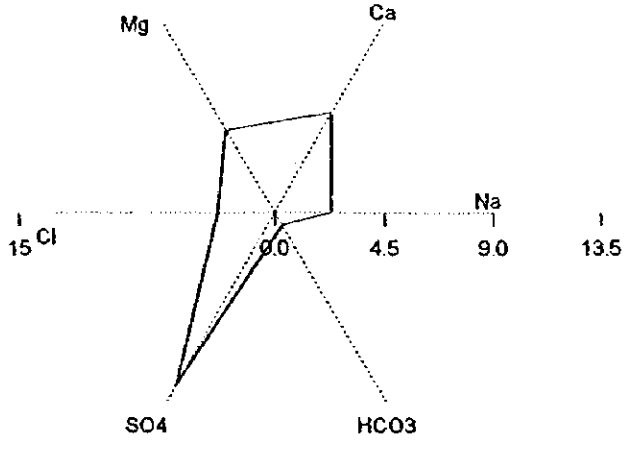
El Talfa Gomaa Khamis 67



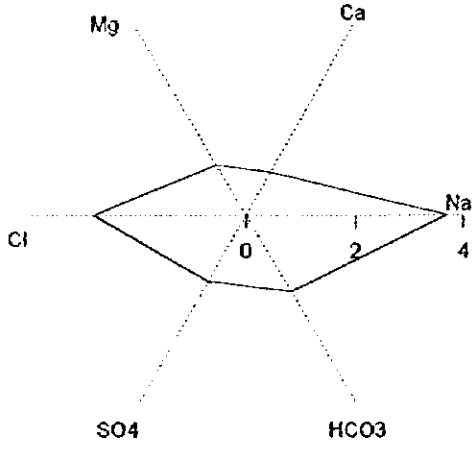
Wadi Watir Furtaga-1 71



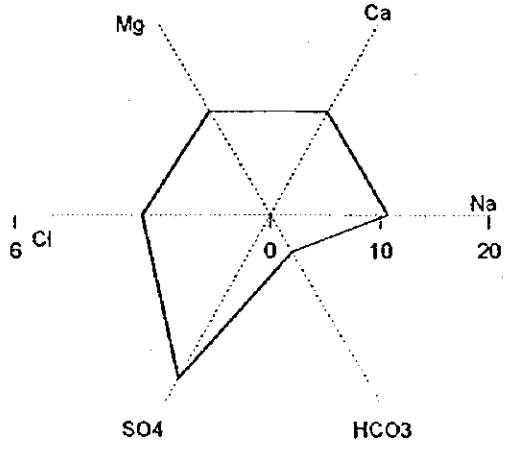
Wadi Watir Saleh Seleem 72



Wadi Zaghara Dug Well 76



Wadi Zalaga Ainez Well 73



2.1.6 Water Quality Data Sheets of Major Water Points (as of August 97)

Database: C:\programs\whi\AquaChem\Sinai Summar.HC3

Cat01	Haroun Well	St. Catherin	Sand and G	Ca-SO4-Cl-HCO3	0068
Cat02	Soyara 1	St. Catherin	Sand and G	Ca-Na-Cl-HCO3-S	0069
Cat03	El Rabba Spr	St. Catherin	Sand and G	Ca-Mg-HCO3-SO4	0070
Dahab01	Reservoir Ta	Wadi Dahab	Sand and G	Na-Ca-Cl	0077
FeiranDW	M. Salem 1	Wadi Feiran	Sand and G	Ca-Na-Mg-Cl-SO4	0065
FeiranDW	Refaay	Wadi Feiran	Sand and G	Ca-Na-Cl-SO4-HC	0066
Malha01	Abd Allah Se	El Malha	Limestone	Na-Ca-Cl-SO4	0081
Malha02	Abd Allah Se	El Malha	Limestone	Na-Ca-Cl-SO4	0082
Nuwe01	E. Hemyed	Nuweiba Coas	Sand and G	Mg-Na-Ca-Cl-SO4	0074
Nuwe02	A. A. Hemad	Nuweiba Coas	Sand and G	Na-Mg-Cl-SO4	0075
QaaCW01	PZ-8	El Qaa Plain	Sand and G	Na-Ca-Cl	0049
QaaCW02	QAA10	El Qaa Plain	Sand and G	Na-Ca-Cl	0050
QaaCW03	QAA8	El Qaa Plain	Sand and G	Na-Ca-Cl-SO4	0051
QaaCW04	QAA12	El Qaa Plain	Sand and G	Na-Ca-Cl-HCO3	0052
QaaCW05	QAA15	El Qaa Plain	Sand and G	Ca-Na-HCO3-Cl	0053
QaaCW06	QAA23	El Qaa Plain	Sand and G	Na-Ca-HCO3-Cl	0054
QaaCW07	QAA21	El Qaa Plain	Sand and G	Na-Ca-Cl-HCO3	0055
QaaCW08	QAA29	El Qaa Plain	Sand and G	Ca-Na-Cl-HCO3	0056
QaaCW09	Abu Kalam	El Qaa Plain	Sand and G	Na-Ca-Cl-SO4	0057
QaaDW01	M Abu Salem	El Qaa Plain	Sand and G	Na-Ca-Cl-SO4	0058
QaaDW02	El Hag Sobah	El Qaa Plain	Sand and G	Ca-Na-SO4-Cl	0059
QaaSP01	Hamam Musa	El Qaa Plain	Sand and G	Na-Ca-Mg-Cl-SO4	0060
QaaSP02	W. Hibran	El Qaa Plain	Sand and G	Ca-Na-Cl-SO4-HC	0061
QaaSP03	W. Mear	El Qaa Plain	Sand and G	Ca-Na-SO4-Cl-HC	0062
QaaSP04	W. Thman	El Qaa Plain	Sand and G		0063
QaaSP05	W. Esra	El Qaa Plain	Sand and G	Na-Ca-Cl-SO4-HC	0064
Sheira01	Sheira-1	Wadi Sheira	Sand Stone	Ca-Mg-Na-Cl-SO4	0078
Spring01	Aynn Musa Sp	Other Spring	Sand Stone	Na-SO4-Cl	0083
Spring02	Hammam Farao	Other Spring	Limestone	Na-Ca-Cl	0084
Spring03	Ain Om Ahmed	Other Spring	Granite	Mg-Ca-Na-SO4-Cl	0085
Sudr01	A. K. Khamis	Rus Sudr	Sand and G	Na-Ca-Mg-Cl-SO4	0079
Sudr02	Ain Abou Rag	Rus Sudr	Limestone	Na-Mg-Cl-SO4	0080
TalfaDW0	Gomaa Khamis	El Talfa	Sand and G	Ca-Na-SO4-HCO3-	0067
Watir01	Furtaga-1	Wadi Watir	Sand and G	Mg-Ca-Na-SO4-Cl	0071
Watir02	Saleh Seleem	Wadi Watir	Sand and G	Ca-Mg-Na-SO4-Cl	0072
Zaghara0	Dug Well	Wadi Zaghara	Sand and G	Na-Mg-Ca-Cl-HCO	0076
Zalaga01	Ainez Well	Wadi Zalaga	Sand and G	Mg-Ca-Na-SO4-Cl	0073

SampleID	:	Cat01
Location	:	St. Catherine
Site	:	Haroun Well
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-SO4-Cl-HCO3
Sum of Anions (meq/l)	:	9.53
Sum of Cations (meq/l)	:	9.54
Balance:	:	0.1%
Total dissolved solids	:	19.1 meq/l 641. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	8.3	41.50	23.24	415.0
Permanent hardness	:	6.0	30.02	16.81	300.2
Temporary hardness	:	2.3	11.48	6.43	114.8
Alkalinity	:	2.3	11.48	6.43	114.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	28.0	1.218	1.218	6.386
K +	1.0	0.026	0.026	0.136
Ca++	135.0	3.368	6.737	35.322
Mg++	19.0	0.782	1.563	8.195
Cl-	83.0	2.341	2.341	12.274
SO4--	235.0	2.446	4.893	25.654
HCO3-	140.0	2.295	2.295	12.033

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	7.105	4.31	0.319	0.194
Ca/SO4	0.574	1.377	0.152	0.364
Na/Cl	0.337	0.52	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	71.248	1.2179
Carbonate (CaCo3)	:	14.034	0.1403
Dolomite (CaMg(CO3)2)	:	143.887	0.782
Anhydrite (CaSO4)	:	333.212	2.446

SampleID	:	Cat02
Location	:	St. Catherine
Site	:	Soyara 1
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Cl-HCO3-SO4
Sum of Anions (meq/l)	:	9.25
Sum of Cations (meq/l)	:	9.22
Balance:	:	0.2%
Total dissolved solids	:	18.5 meq/l 627. mg/l

Hardness	:	meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	:	6.19	30.95	17.33	309.5
Permanent hardness	:	2.68	13.40	7.51	134.0
Temporary hardness	:	3.51	17.54	9.82	175.4
Alkalinity	:	3.51	17.54	9.82	175.4

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	69.0	3.001	3.001	16.252
K +	1.0	0.026	0.026	0.141
Ca++	96.0	2.395	4.79	25.94
Mg++	17.0	0.699	1.399	7.576
Cl-	129.0	3.639	3.639	19.707
SO4--	101.0	1.051	2.103	11.389
HCO3-	214.0	3.508	3.508	18.998

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.647	3.425	0.319	0.194
Ca/SO4	0.95	2.278	0.152	0.364
Na/Cl	0.535	0.825	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	175.576	3.0013
Carbonate (CaCo3)	:	64.508	0.6451
Dolomite (CaMg(CO3)2)	:	128.741	0.699
Anhydrite (CaSO4)	:	143.21	1.051

SampleID : CatO3
Location : St. Catherine
Site : El Rabba Spring
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Ca-Mg-HCO3-SO4

Sum of Anions (meq/l) : 2.48
Sum of Cations (meq/l) : 2.43
Balance: : 1.0%

Total dissolved solids : 4.9 meq/l 176.4 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 2.07	10.35	5.80	103.5
Permanent hardness	: 0.55	2.73	1.53	27.3
Temporary hardness	: 1.52	7.62	4.27	76.2
Alkalinity	: 1.52	7.62	4.27	76.2

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	8.0	0.348	0.348	7.096
K +	0.4	0.01	0.01	0.204
Ca++	25.0	0.624	1.248	25.448
Mg++	10.0	0.411	0.823	16.782
Cl-	16.0	0.451	0.451	9.196
SO4--	24.0	0.25	0.5	10.195
HCO3-	93.0	1.524	1.524	31.076

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.5	1.516	0.319	0.194
Ca/SO4	1.042	2.496	0.152	0.364
Na/Cl	0.5	0.771	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	20.357	0.348
Dolomite (CaMg(CO3)2):		75.73	0.411
Anhydrite (CaSO4)	:	34.03	0.25

SampleID	: Dahab01
Location	: Wadi Dahab
Site	: Reservoir Tank
Sampling Date	: Aug1997
Geology	: Sand and G
Watertype	: Na-Ca-Cl
Sum of Anions (meq/l)	: 52.32
Sum of Cations (meq/l)	: 52.18
Balance:	: 0.1%
Total dissolved solids	: 104.5 meq/l 3158. mg/l

Hardness	: meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	: 27.63	138.14	77.36	1381.4
Permanent hardness	: 23.07	115.36	64.60	1153.6
Temporary hardness	: 4.56	22.78	12.76	227.8
Alkalinity	: 4.56	22.78	12.76	227.8

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	558.0	24.271	24.271	23.225
K +	11.0	0.281	0.281	0.269
Ca++	463.0	11.552	23.104	22.108
Mg++	55.0	2.262	4.525	4.33
Cl-	1413.0	39.856	39.856	38.138
SO4--	380.0	3.956	7.912	7.571
HCO3-	278.0	4.557	4.557	4.361

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	8.418	5.106	0.319	0.194
Ca/SO4	1.218	2.92	0.152	0.364
Na/Cl	0.395	0.609	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	1419.878	24.2714
Carbonate (CaCo3) :	533.876	5.3388
Dolomite (CaMg(CO3)2):	416.516	2.262
Anhydrite (CaSO4) :	538.811	3.956

SampleID	:	FeiranDW01
Location	:	Wadi Feiran
Site	:	M. Salem 1
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Mg-Cl-SO4-HCO3

Sum of Anions (meq/l)	:	10.09
Sum of Cations (meq/l)	:	10.04
Balance:	:	0.3%

Total dissolved solids	:	20.1 meq/l	666. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	7.54	37.72	21.12	377.2
Permanent hardness	:	4.76	23.78	13.32	237.8
Temporary hardness	:	2.79	13.93	7.80	139.3
Alkalinity	:	2.79	13.93	7.80	139.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	55.0	2.392	2.392	11.883
K +	4.0	0.102	0.102	0.507
Ca++	105.0	2.62	5.24	26.031
Mg++	28.0	1.152	2.304	11.446
Cl-	132.0	3.723	3.723	18.495
SO4--	172.0	1.791	3.581	17.79
HCO3-	170.0	2.787	2.787	13.845

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.75	2.275	0.319	0.194
Ca/SO4	0.61	1.463	0.152	0.364
Na/Cl	0.417	0.643	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	139.952	2.3923
Dolomite (CaMg(CO3)2)	:	212.044	1.152
Anhydrite (CaSO4)	:	243.883	1.791

SampleID	:	FeiranDW02
Location	:	Wadi Feiran
Site	:	Refaay
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Cl-SO4-HCO3
Sum of Anions (meq/l)	:	8.29
Sum of Cations (meq/l)	:	8.31
Balance:	:	0.1%
Total dissolved solids	:	16.6 meq/l 563. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	5.23	26.16	14.65	261.6
Permanent hardness	:	2.71	13.53	7.58	135.3
Temporary hardness	:	2.52	12.62	7.07	126.2
Alkalinity	:	2.52	12.62	7.07	126.2

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	69.0	3.001	3.001	18.076
K +	3.0	0.077	0.077	0.464
Ca++	90.0	2.246	4.491	27.051
Mg++	9.0	0.37	0.74	4.457
Cl-	110.0	3.103	3.103	18.691
SO4--	128.0	1.333	2.665	16.052
HCO3-	154.0	2.524	2.524	15.203

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	10.0	6.065	0.319	0.194
Ca/SO4	0.703	1.685	0.152	0.364
Na/Cl	0.627	0.967	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	175.576	3.0013
Carbonate (CaCo3)	:	54.328	0.5433
Dolomite (CaMg(CO3)2)	:	68.157	0.37
Anhydrite (CaSO4)	:	181.494	1.333

SampleID : Malha01
Location : El Malha
Site : Abd Allah Seleman Well (1)
Sampling Date : Aug1997
Geology : Limestone
Watertype : Na-Ca-Cl-SO4

Sum of Anions (meq/l) : 33.93
Sum of Cations (meq/l) : 33.83
Balance: : 0.2%

Total dissolved solids : 67.8 meq/l 2106.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 16.71	83.57	46.80	835.7
Permanent hardness	: 13.68	68.41	38.31	684.1
Temporary hardness	: 3.03	15.16	8.49	151.6
Alkalinity	: 3.03	15.16	8.49	151.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	391.0	17.007	17.007	25.101
K +	4.0	0.102	0.102	0.151
Ca++	269.0	6.712	13.423	19.811
Mg++	40.0	1.645	3.291	4.857
Cl-	752.0	21.211	21.211	31.306
SO4--	465.0	4.841	9.682	14.29
HCO3-	185.0	3.032	3.032	4.475

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6.725	4.079	0.319	0.194
Ca/SO4	0.578	1.386	0.152	0.364
Na/Cl	0.52	0.802	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	994.933	17.0074
Carbonate (CaCo3)	:	22.546	0.2255
Dolomite (CaMg(CO3)2)	:	302.921	1.645
Anhydrite (CaSO4)	:	659.334	4.841

SampleID : Malha02
Location : El Malha
Site : Abd Allah Seleman Well (2)
Sampling Date : Aug1997
Geology : Limestone
Watertype : Na-Ca-Cl-SO4

Sum of Anions (meq/l) : 34.15
Sum of Cations (meq/l) : 34.07
Balance: : 0.1%

Total dissolved solids : 68.2 meq/l 2091.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 18.9	94.51	52.93	945.1
Permanent hardness	: 15.71	78.53	43.98	785.3
Temporary hardness	: 3.2	15.98	8.95	159.8
Alkalinity	: 3.2	15.98	8.95	159.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	345.0	15.007	15.007	22.0
K +	6.0	0.153	0.153	0.224
Ca++	270.0	6.737	13.473	19.751
Mg++	66.0	2.715	5.43	7.96
Cl-	782.0	22.057	22.057	32.336
SO4--	427.0	4.445	8.891	13.034
HCO3-	195.0	3.196	3.196	4.685

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.091	2.481	0.319	0.194
Ca/SO4	0.632	1.515	0.152	0.364
Na/Cl	0.441	0.68	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	877.882	15.0065
Dolomite (CaMg(CO3)2):	499.819	2.715
Anhydrite (CaSO4) :	605.453	4.445

SampleID	:	Nuwe01
Location	:	Nuweiba Coastal Plain
Site	:	E. Hemyed
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Mg-Na-Ca-Cl-SO4

Sum of Anions (meq/l)	:	31.92
Sum of Cations (meq/l)	:	31.77
Balance:	:	0.2%

Total dissolved solids : 63.7 meq/l 1946. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	20.94	104.70	58.63	1047.0
Permanent hardness	:	16.38	81.91	45.87	819.1
Temporary hardness	:	4.56	22.79	12.76	227.9
Alkalinity	:	4.56	22.79	12.76	227.9

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	242.0	10.526	10.526	16.527
K +	12.0	0.307	0.307	0.482
Ca++	141.0	3.518	7.036	11.047
Mg++	169.0	6.952	13.904	21.831
Cl-	592.0	16.698	16.698	26.218
SO4--	512.0	5.33	10.66	16.738
HCO3-	278.0	4.557	4.557	7.155

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.834	0.506	0.319	0.194
Ca/SO4	0.275	0.66	0.152	0.364
Na/Cl	0.409	0.63	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	615.789	10.5263
Anhydrite (CaSO4)	:	725.977	5.33

SampleID : Nuwe02
Location : Nuweiba Coastal Plain
Site : A. A. Hemad
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Na-Mg-Cl-SO4

Sum of Anions (meq/l) : 56.14
Sum of Cations (meq/l) : 55.91
Balance: : 0.2%

Total dissolved solids : 112.1 meq/l 3447. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 25.26	126.30	70.73	1263.0
Permanent hardness	: 21.49	107.45	60.17	1074.5
Temporary hardness	: 3.77	18.85	10.56	188.5
Alkalinity	: 3.77	18.85	10.56	188.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	690.0	30.013	30.013	26.785
K +	25.0	0.639	0.639	0.57
Ca++	221.0	5.514	11.028	9.842
Mg++	173.0	7.116	14.233	12.702
Cl-	1148.0	32.381	32.381	28.898
SO4--	960.0	9.994	19.988	17.838
HCO3-	230.0	3.77	3.77	3.364

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.277	0.775	0.319	0.194
Ca/SO4	0.23	0.552	0.152	0.364
Na/Cl	0.601	0.927	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	1755.763	30.0131
Anhydrite (CaSO4) :	1361.206	9.994

SampleID	: QaaCW01
Location	: El Qaa Plain
Site	: PZ-8
Sampling Date	: Aug1997
Geology	: Sand and G
Watertype	: Na-Ca-Cl
Sum of Anions (meq/l)	: 72.26
Sum of Cations (meq/l)	: 72.18
Balance:	: 0.1%
Total dissolved solids	: 144.4 meq/l 4409. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 17.39	86.93	48.68	869.3
Permanent hardness	: 12.96	64.80	36.29	648.0
Temporary hardness	: 4.43	22.13	12.39	221.3
Alkalinity	: 4.43	22.13	12.39	221.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1252.0	54.458	54.458	37.702
K +	13.0	0.332	0.332	0.23
Ca++	294.0	7.335	14.671	10.157
Mg++	33.0	1.357	2.715	1.88
Cl-	2005.0	56.554	56.554	39.153
SO4--	542.0	5.643	11.285	7.813
HCO3-	270.0	4.426	4.426	3.064

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	8.909	5.404	0.319	0.194
Ca/SO4	0.542	1.3	0.152	0.364
Na/Cl	0.624	0.963	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	3185.82	54.4585
Carbonate (CaCo3) :	33.566	0.3357
Dolomite (CaMg(CO3)2):	249.91	1.357
Anhydrite (CaSO4) :	768.514	5.643

SampleID	:	QaaCW02
Location	:	El Qaa Plain
Site	:	QAA10
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl
Sum of Anions (meq/l)	:	33.93
Sum of Cations (meq/l)	:	33.85
Balance:	:	0.1%
Total dissolved solids	:	67.8 meq/l 2135.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	8.48	42.41	23.75	424.1
Permanent hardness	:	4.27	21.34	11.95	213.4
Temporary hardness	:	4.21	21.06	11.80	210.6
Alkalinity	:	4.21	21.06	11.80	210.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	575.0	25.011	25.011	36.897
K +	14.0	0.358	0.358	0.528
Ca++	137.0	3.418	6.836	10.085
Mg++	20.0	0.823	1.645	2.427
Cl-	833.0	23.496	23.496	34.662
SO4--	299.0	3.113	6.226	9.185
HCO3-	257.0	4.213	4.213	6.215

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6.85	4.155	0.319	0.194
Ca/SO4	0.458	1.098	0.152	0.364
Na/Cl	0.69	1.064	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	38.77	0.6627
Dolomite (CaMg(CO3)2):		151.46	0.823
Anhydrite (CaSO4)	:	423.959	3.113

SampleID	:	QaaCW03
Location	:	El Qaa Plain
Site	:	QAA8
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl-SO4
Sum of Anions (meq/l)	:	22.82
Sum of Cations (meq/l)	:	22.78
Balance:	:	0.1%
Total dissolved solids	:	45.6 meq/l 1480. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	11.72	58.58	32.80	585.8
Permanent hardness	:	7.52	37.60	21.05	376.0
Temporary hardness	:	4.2	20.98	11.75	209.8
Alkalinity	:	4.2	20.98	11.75	209.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	252.0	10.961	10.961	24.035
K +	4.0	0.102	0.102	0.224
Ca++	215.0	5.364	10.729	23.527
Mg++	12.0	0.494	0.987	2.164
Cl-	433.0	12.213	12.213	26.781
SO4--	308.0	3.206	6.413	14.063
HCO3-	256.0	4.196	4.196	9.201

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	17.917	10.867	0.319	0.194
Ca/SO4	0.698	1.673	0.152	0.364
Na/Cl	0.582	0.897	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	641.235	10.9613
Carbonate (CaCo3)	:	166.585	1.6658
Dolomite (CaMg(CO3)2)	:	90.876	0.494
Anhydrite (CaSO4)	:	436.72	3.206

SampleID	:	QaaCW04
Location	:	El Qaa Plain
Site	:	QAA12
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl-HCO3
Sum of Anions (meq/l)	:	9.56
Sum of Cations (meq/l)	:	9.60
Balance:	:	0.2%
Total dissolved solids	:	19.2 meq/l 653.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	4.17	20.86	11.68	208.6
Permanent hardness	:	0.56	2.82	1.58	28.2
Temporary hardness	:	3.61	18.03	10.10	180.3
Alkalinity	:	3.61	18.03	10.10	180.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	123.0	5.35	5.35	27.922
K +	3.0	0.077	0.077	0.402
Ca++	77.0	1.921	3.842	20.052
Mg++	4.0	0.165	0.329	1.717
Cl-	169.0	4.767	4.767	24.88
SO4--	57.0	0.593	1.187	6.195
HCO3-	220.0	3.606	3.606	18.82

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	19.25	11.676	0.319	0.194
Ca/SO4	1.351	3.238	0.152	0.364
Na/Cl	0.728	1.122	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.866	0.1345
Carbonate (CaCo3)	:	116.438	1.1644
Dolomite (CaMg(CO3)2)	:	30.292	0.165
Anhydrite (CaSO4)	:	80.822	0.593

SampleID	:	QaaCW05
Location	:	El Qaa Plain
Site	:	QAA15
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-HCO3-Cl

Sum of Anions (meq/l)	:	6.75
Sum of Cations (meq/l)	:	6.68
Balance:	:	0.5%

Total dissolved solids	:	13.4 meq/l	467. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	3.6	18.02	10.09	180.2
Permanent hardness	:	0.67	3.35	1.88	33.5
Temporary hardness	:	2.93	14.67	8.22	146.7
Alkalinity	:	2.93	14.67	8.22	146.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	69.0	3.001	3.001	22.343
K +	3.0	0.077	0.077	0.573
Ca++	64.0	1.597	3.194	23.78
Mg++	5.0	0.206	0.411	3.06
Cl-	102.0	2.877	2.877	21.42
SO4--	45.0	0.468	0.937	6.976
HCO3-	179.0	2.934	2.934	21.844

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	12.8	7.764	0.319	0.194
Ca/SO4	1.422	3.409	0.152	0.364
Na/Cl	0.676	1.043	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4.747	0.0812
Carbonate (CaCo3)	:	92.358	0.9236
Dolomite (CaMg(CO3)2):		37.865	0.206
Anhydrite (CaSO4)	:	63.807	0.468

SampleID	: QaaCW06
Location	: El Qaa Plain
Site	: QAA23
Sampling Date	: Aug1997
Geology	: Sand and G
Watertype	: Na-Ca-HCO3-Cl

Sum of Anions (meq/l)	: 6.90
Sum of Cations (meq/l)	: 6.89
Balance:	: 0.1%

Total dissolved solids : 13.8 meq/l 481.1 mg/l

Hardness	: meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	: 2.81	14.03	7.86	140.3
Permanent hardness	: 0.0	0.00	0.00	0.0
Temporary hardness	: 2.81	14.03	7.86	140.3
Alkalinity	: 2.84	14.18	7.94	141.8

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	92.0	4.002	4.002	29.029
K +	3.0	0.077	0.077	0.559
Ca++	48.0	1.198	2.395	17.372
Mg++	5.0	0.206	0.411	2.981
Cl-	99.0	2.792	2.792	20.252
SO4--	61.0	0.635	1.27	9.212
HCO3-	173.0	2.836	2.836	20.571

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9.6	5.823	0.319	0.194
Ca/SO4	0.787	1.886	0.152	0.364
Na/Cl	0.929	1.433	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4.608	0.0788
Carbonate (CaCo3)	:	35.724	0.3572
Dolomite (CaMg(CO3)2)	:	37.865	0.206
Anhydrite (CaSO4)	:	86.493	0.635

SampleID	: QaaCW07
Location	: El Qaa Plain
Site	: QAA21
Sampling Date	: Aug1997
Geology	: Sand and G
Watertype	: Na-Ca-Cl-HCO3

Sum of Anions (meq/l)	: 8.86
Sum of Cations (meq/l)	: 8.82
Balance:	: 0.2%

Total dissolved solids : 17.7 meq/l 609.1 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 3.74	18.69	10.46	186.9
Permanent hardness	: 0.23	1.15	0.64	11.5
Temporary hardness	: 3.51	17.54	9.82	175.4
Alkalinity	: 3.51	17.54	9.82	175.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	115.0	5.002	5.002	28.293
K +	3.0	0.077	0.077	0.436
Ca++	65.0	1.622	3.244	18.349
Mg++	6.0	0.247	0.494	2.794
Cl-	144.0	4.062	4.062	22.976
SO4--	62.0	0.645	1.291	7.302
HCO3-	214.0	3.508	3.508	19.843

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	10.833	6.571	0.319	0.194
Ca/SO4	1.048	2.513	0.152	0.364
Na/Cl	0.799	1.232	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	6.702	0.1146
Carbonate (CaCo3)	:	73.022	0.7302
Dolomite (CaMg(CO3)2)	:	45.438	0.247
Anhydrite (CaSO4)	:	87.911	0.645

SampleID	:	QaaCW08
Location	:	El Qaa Plain
Site	:	QAA29
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Cl-HCO3
Sum of Anions (meq/l)	:	6.57
Sum of Cations (meq/l)	:	6.54
Balance:	:	0.3%
Total dissolved solids	:	13.1 meq/l 452.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	3.46	17.28	9.67	172.8
Permanent hardness	:	0.77	3.83	2.15	38.3
Temporary hardness	:	2.69	13.44	7.53	134.4
Alkalinity	:	2.69	13.44	7.53	134.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	69.0	3.001	3.001	22.895
K +	3.0	0.077	0.077	0.587
Ca++	61.0	1.522	3.044	23.223
Mg++	5.0	0.206	0.411	3.136
Cl-	103.0	2.905	2.905	22.162
SO4--	47.0	0.489	0.979	7.469
HCO3-	164.0	2.688	2.688	20.507

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	12.2	7.4	0.319	0.194
Ca/SO4	1.298	3.11	0.152	0.364
Na/Cl	0.67	1.033	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	4.794	0.0819
Carbonate (CaCo3) :	82.781	0.8278
Dolomite (CaMg(CO3)2):	37.865	0.206
Anhydrite (CaSO4) :	66.642	0.489

SampleID	:	QaaCW09
Location	:	El Qaa Plain
Site	:	Abu Kalam
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl-SO4
Sum of Anions (meq/l)	:	63.00
Sum of Cations (meq/l)	:	62.86
Balance:	:	0.1%
Total dissolved solids	:	125.9 meq/l 3882. mg/l

Hardness	:	meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	:	27.74	138.71	77.68	1387.1
Permanent hardness	:	23.66	118.30	66.25	1183.0
Temporary hardness	:	4.08	20.41	11.43	204.1
Alkalinity	:	4.08	20.41	11.43	204.1

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	805.0	35.015	35.015	27.821
K +	4.0	0.102	0.102	0.081
Ca++	490.0	12.226	24.451	19.428
Mg++	40.0	1.645	3.291	2.615
Cl-	1510.0	42.592	42.592	33.842
SO4--	784.0	8.162	16.324	12.97
HCO3-	249.0	4.081	4.081	3.243

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	12.25	7.43	0.319	0.194
Ca/SO4	0.625	1.498	0.152	0.364
Na/Cl	0.533	0.822	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2048.391	35.0152
Carbonate (CaCo3)	:	242.065	2.4206
Dolomite (CaMg(CO3)2)	:	302.921	1.645
Anhydrite (CaSO4)	:	1111.651	8.162

SampleID : QaaDW01
Location : El Qaa Plain
Site : M Abu Salem
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Na-Ca-Cl-SO4

Sum of Anions (meq/l) : 37.16
Sum of Cations (meq/l) : 37.05
Balance: : 0.18

Total dissolved solids : 74.2 meq/l 2308. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 13.48	67.41	37.75	674.1
Permanent hardness	: 9.63	48.15	26.96	481.5
Temporary hardness	: 3.85	19.26	10.79	192.6
Alkalinity	: 3.85	19.26	10.79	192.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	537.0	23.358	23.358	31.479
K +	8.0	0.205	0.205	0.276
Ca++	196.0	4.89	9.78	13.18
Mg++	45.0	1.851	3.702	4.989
Cl-	881.0	24.85	24.85	33.49
SO4--	406.0	4.227	8.453	11.392
HCO3-	235.0	3.852	3.852	5.191

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.356	2.642	0.319	0.194
Ca/SO4	0.483	1.157	0.152	0.364
Na/Cl	0.61	0.94	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	1366.442	23.358
Dolomite (CaMg(CO3)2):	340.786	1.851
Anhydrite (CaSO4) :	575.677	4.227

SampleID	:	QaaDW02
Location	:	El Qaa Plain
Site	:	El Hag Sobahe
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-SO4-Cl

Sum of Anions (meq/l)	:	25.10
Sum of Cations (meq/l)	:	25.04
Balance:	:	0.1%

Total dissolved solids	:	50.1 meq/l	1639. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	14.63	73.13	40.95	731.3
Permanent hardness	:	11.23	56.16	31.45	561.6
Temporary hardness	:	3.39	16.97	9.50	169.7
Alkalinity	:	3.39	16.97	9.50	169.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	237.0	10.309	10.309	20.562
K +	4.0	0.102	0.102	0.203
Ca++	242.0	6.038	12.076	24.086
Mg++	31.0	1.275	2.55	5.086
Cl-	351.0	9.9	9.9	19.746
SO4--	567.0	5.903	11.806	23.548
HCO3-	207.0	3.393	3.393	6.767

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	7.806	4.735	0.319	0.194
Ca/SO4	0.427	1.023	0.152	0.364
Na/Cl	0.675	1.041	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	16.336	0.2793
Dolomite (CaMg(CO3)2)	:	234.763	1.275
Anhydrite (CaSO4)	:	803.962	5.903

SampleID	:	QaaSP01
Location	:	El Qaa Plain
Site	:	Hamam Musa
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-Cl-SO4
Sum of Anions (meq/l)	:	127.95
Sum of Cations (meq/l)	:	127.46
Balance:	:	0.2%
Total dissolved solids	:	255.4 meq/l 7540. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	60.82	304.09	170.29	3040.9
Permanent hardness	:	55.78	278.92	156.20	2789.2
Temporary hardness	:	5.03	25.16	14.09	251.6
Alkalinity	:	5.03	25.16	14.09	251.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1501.0	65.289	65.289	25.563
K +	53.0	1.355	1.355	0.531
Ca++	617.0	15.394	30.788	12.054
Mg++	365.0	15.014	30.029	11.757
Cl-	3401.0	95.93	95.93	37.559
SO4--	1296.0	13.492	26.984	10.565
HCO3-	307.0	5.032	5.032	1.97

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.69	1.025	0.319	0.194
Ca/SO4	0.476	1.141	0.152	0.364
Na/Cl	0.441	0.681	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	3819.421	65.2893
Dolomite (CaMg(CO3)2):		2764.151	15.014
Anhydrite (CaSO4)	:	1837.628	13.492

SampleID	:	QaaSP02
Location	:	El Qaa Plain
Site	:	W. Hibran
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-Cl-SO4-HCO3
Sum of Anions (meq/l)	:	21.37
Sum of Cations (meq/l)	:	21.33
Balance:	:	0.18
Total dissolved solids	:	42.7 meq/l 1420.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.26	61.31	34.33	613.1
Permanent hardness	:	7.93	39.67	22.22	396.7
Temporary hardness	:	4.33	21.64	12.12	216.4
Alkalinity	:	4.33	21.64	12.12	216.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	202.0	8.786	8.786	20.573
K +	11.0	0.281	0.281	0.658
Ca++	221.0	5.514	11.028	25.823
Mg++	15.0	0.617	1.234	2.89
Cl-	315.0	8.885	8.885	20.805
SO4--	392.0	4.081	8.162	19.112
HCO3-	264.0	4.327	4.327	10.132

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	14.733	8.936	0.319	0.194
Ca/SO4	0.564	1.351	0.152	0.364
Na/Cl	0.641	0.989	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	514.006	8.7864
Carbonate (CaCo3)	:	81.681	0.8168
Dolomite (CaMg(CO3)2)	:	113.595	0.617
Anhydrite (CaSO4)	:	555.826	4.081

SampleID	:	QaaSP03
Location	:	El Qaa Plain
Site	:	W. Mear
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Na-SO4-Cl-HCO3
Sum of Anions (meq/l)	:	7.84
Sum of Cations (meq/l)	:	7.85
Balance:	:	0.1%
Total dissolved solids	:	15.7 meq/l 533. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	5.53	27.64	15.48	276.4
Permanent hardness	:	3.07	15.35	8.59	153.5
Temporary hardness	:	2.46	12.30	6.89	123.0
Alkalinity	:	2.46	12.30	6.89	123.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	51.0	2.218	2.218	14.139
K +	4.0	0.102	0.102	0.65
Ca++	91.0	2.27	4.541	28.948
Mg++	12.0	0.494	0.987	6.292
Cl-	94.0	2.651	2.651	16.9
SO4--	131.0	1.364	2.728	17.39
HCO3-	150.0	2.459	2.459	15.676

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	7.583	4.6	0.319	0.194
Ca/SO4	0.695	1.665	0.152	0.364
Na/Cl	0.543	0.837	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	129.774	2.2184
Carbonate (CaCo3)	:	41.346	0.4135
Dolomite (CaMg(CO3)2)	:	90.876	0.494
Anhydrite (CaSO4)	:	185.748	1.364

SampleID	: QaaSP04
Location	: El Qaa Plain
Site	: W. Thman
Sampling Date	: Aug1997
Geology	: Sand and G
Watertype	:

SampleID	:	QaaSP05
Location	:	El Qaa Plain
Site	:	W. Esra
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Cl-SO4-HCO3

Sum of Anions (meq/l)	:	11.78
Sum of Cations (meq/l)	:	11.75
Balance:	:	0.1%

Total dissolved solids	:	23.5 meq/l	794. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	5.87	29.37	16.45	293.7
Permanent hardness	:	2.94	14.70	8.23	147.0
Temporary hardness	:	2.93	14.67	8.22	146.7
Alkalinity	:	2.93	14.67	8.22	146.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	131.0	5.698	5.698	24.217
K +	7.0	0.179	0.179	0.761
Ca++	93.0	2.32	4.641	19.725
Mg++	15.0	0.617	1.234	5.245
Cl-	157.0	4.428	4.428	18.819
SO4--	212.0	2.207	4.414	18.76
HCO3-	179.0	2.934	2.934	12.47

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6.2	3.761	0.319	0.194
Ca/SO4	0.439	1.051	0.152	0.364
Na/Cl	0.834	1.287	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.307	0.1249
Dolomite (CaMg(CO3)2):		113.595	0.617
Anhydrite (CaSO4)	:	300.6	2.207

SampleID : Sheira01
Location : Wadi Sheira
Site : Sheira-1
Sampling Date : Aug1997
Geology : Sand Stone
Watertype : Ca-Mg-Na-Cl-SO4-HCO3

Sum of Anions (meq/l) : 22.53
Sum of Cations (meq/l) : 22.40
Balance: : 0.3%

Total dissolved solids : 44.9 meq/l 1428. mg/l

Hardness	meq/l	°f	°g	mg/l CaCO3
Total hardness	15.37	76.85	43.04	768.5
Permanent hardness	10.27	51.36	28.76	513.6
Temporary hardness	5.1	25.49	14.27	254.9
Alkalinity	5.1	25.49	14.27	254.9

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	155.0	6.742	6.742	15.008
K +	11.0	0.281	0.281	0.626
Ca++	158.0	3.942	7.884	17.55
Mg++	91.0	3.743	7.487	16.666
Cl-	381.0	10.747	10.747	23.923
SO4--	321.0	3.342	6.684	14.879
HCO3-	311.0	5.098	5.098	11.348

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.736	1.053	0.319	0.194
Ca/SO4	0.492	1.18	0.152	0.364
Na/Cl	0.407	0.627	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	394.411	6.7421
Dolomite (CaMg(CO3)2):		689.144	3.743
Anhydrite (CaSO4)	:	455.153	3.342

SampleID	:	Spring01
Location	:	Other Springs
Site	:	Aynn Musa Spring
Sampling Date	:	Aug1997
Geology	:	Sand Stone
Watertype	:	Na-SO4-Cl
Sum of Anions (meq/l)	:	55.93
Sum of Cations (meq/l)	:	55.89
Balance:	:	0.0%
Total dissolved solids	:	111.8 meq/l 3705.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	16.03	80.13	44.87	801.3
Permanent hardness	:	10.91	54.56	30.55	545.6
Temporary hardness	:	5.11	25.57	14.32	255.7
Alkalinity	:	5.11	25.57	14.32	255.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	897.0	39.017	39.017	34.891
K +	33.0	0.844	0.844	0.755
Ca++	214.0	5.339	10.679	9.55
Mg++	65.0	2.674	5.348	4.782
Cl-	724.0	20.421	20.421	18.261
SO4--	1460.0	15.199	30.399	27.184
HCO3-	312.0	5.114	5.114	4.573

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.292	1.997	0.319	0.194
Ca/SO4	0.147	0.351	0.152	0.364
Na/Cl	1.239	1.911	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	33.697	0.576
Anhydrite (CaSO4)	:	2070.167	15.199

SampleID : Spring02
Location : Other Springs
Site : Hammam Faraoun Hot Spring
Sampling Date : Aug1997
Geology : Limestone
Watertype : Na-Ca-Cl

Sum of Anions (meq/l) : 244.35
Sum of Cations (meq/l) : 243.78
Balance: : 0.1%

Total dissolved solids : 488.1 meq/l 14374. mg/l

Hardness	meq/l	°f	°g	mg/l CaCO3
Total hardness	85.03	425.16	238.09	4251.6
Permanent hardness	79.93	399.67	223.82	3996.7
Temporary hardness	5.1	25.49	14.27	254.9
Alkalinity	5.1	25.49	14.27	254.9

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	3565.0	155.067	155.067	31.767
K +	144.0	3.683	3.683	0.755
Ca++	1188.0	29.641	59.281	12.144
Mg++	313.0	12.875	25.751	5.275
Cl-	7437.0	209.771	209.771	42.974
SO4--	1416.0	14.741	29.483	6.04
HCO3-	311.0	5.098	5.098	1.044

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.796	2.302	0.319	0.194
Ca/SO4	0.839	2.011	0.152	0.364
Na/Cl	0.479	0.739	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	9071.444	155.0674
Carbonate (CaCo3) :	202.598	2.026
Dolomite (CaMg(CO3)2):	2370.354	12.875
Anhydrite (CaSO4) :	2007.779	14.741

SampleID : Spring03
Location : Other Springs
Site : Ain Om Ahmed Spring
Sampling Date : Aug1997
Geology : Granite
Watertype : Mg-Ca-Na-SO4-Cl

Sum of Anions (meq/l) : 36.02
Sum of Cations (meq/l) : 35.83
Balance: : 0.3%

Total dissolved solids : 71.8 meq/l 2264. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 25.26	126.30	70.73	1263.0
Permanent hardness	: 21.59	107.94	60.45	1079.4
Temporary hardness	: 3.67	18.36	10.28	183.6
Alkalinity	: 3.67	18.36	10.28	183.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	237.0	10.309	10.309	14.349
K +	10.0	0.256	0.256	0.356
Ca++	221.0	5.514	11.028	15.349
Mg++	173.0	7.116	14.233	19.81
Cl-	436.0	12.298	12.298	17.117
SO4--	963.0	10.025	20.051	27.908
HCO3-	224.0	3.672	3.672	5.111

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.277	0.775	0.319	0.194
Ca/SO4	0.229	0.55	0.152	0.364
Na/Cl	0.544	0.838	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	603.067	10.3088
Anhydrite (CaSO4) :	1365.46	10.025

SampleID	:	Sudr01
Location	:	Rus Sudr
Site	:	A. K. Khamis
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Na-Ca-Mg-Cl-SO4

Sum of Anions (meq/l)	:	73.41
Sum of Cations (meq/l)	:	73.17
Balance:	:	0.2%

Total dissolved solids	:	146.6 meq/l	4547.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	35.32	176.61	98.90	1766.1
Permanent hardness	:	31.58	157.92	88.44	1579.2
Temporary hardness	:	3.74	18.69	10.47	186.9
Alkalinity	:	3.74	18.69	10.47	186.9

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	863.0	37.538	37.538	25.61
K +	12.0	0.307	0.307	0.209
Ca++	388.0	9.681	19.361	13.209
Mg++	194.0	7.98	15.961	10.889
Cl-	1365.0	38.502	38.502	26.267
SO4--	1497.0	15.585	31.169	21.264
HCO3-	228.0	3.737	3.737	2.549

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.0	1.213	0.319	0.194
Ca/SO4	0.259	0.621	0.152	0.364
Na/Cl	0.632	0.975	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2195.977	37.5381
Anhydrite (CaSO4)	:	2122.631	15.585

SampleID	:	Sudr02
Location	:	Rus Sudr
Site	:	Ain Abou Ragem
Sampling Date	:	Aug1997
Geology	:	Limestone
Watertype	:	Na-Mg-Cl-SO4
Sum of Anions (meq/l)	:	106.65
Sum of Cations (meq/l)	:	106.24
Balance:	:	0.2%
Total dissolved solids	:	212.9 meq/l 6387.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	42.07	210.33	117.78	2103.3
Permanent hardness	:	37.05	185.25	103.74	1852.5
Temporary hardness	:	5.02	25.08	14.04	250.8
Alkalinity	:	5.02	25.08	14.04	250.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1466.0	63.767	63.767	29.952
K +	16.0	0.409	0.409	0.192
Ca++	322.0	8.034	16.068	7.547
Mg++	316.0	12.999	25.998	12.212
Cl-	2595.0	73.196	73.196	34.381
SO4--	1366.0	14.221	28.442	13.36
HCO3-	306.0	5.016	5.016	2.356

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.019	0.618	0.319	0.194
Ca/SO4	0.236	0.565	0.152	0.364
Na/Cl	0.565	0.871	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	3730.361	63.7669
Anhydrite (CaSO4)	:	1936.883	14.221

SampleID : TalfaDW01
Location : El Talfa
Site : Gomaa Khamis
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Ca-Na-SO4-HCO3-Cl

Sum of Anions (meq/l) : 8.01
Sum of Cations (meq/l) : 8.02
Balance: : 0.0%

Total dissolved solids : 16.0 meq/l 545. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 6.36	31.78	17.80	317.8
Permanent hardness	: 4.13	20.64	11.56	206.4
Temporary hardness	: 2.23	11.15	6.24	111.5
Alkalinity	: 2.23	11.15	6.24	111.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	37.0	1.609	1.609	10.036
K +	2.0	0.051	0.051	0.318
Ca++	101.0	2.52	5.04	31.437
Mg++	16.0	0.658	1.316	8.209
Cl-	70.0	1.974	1.974	12.313
SO4--	183.0	1.905	3.81	23.765
HCO3-	136.0	2.229	2.229	13.904

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6.313	3.829	0.319	0.194
Ca/SO4	0.552	1.323	0.152	0.364
Na/Cl	0.529	0.815	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	94.15	1.6094
Dolomite (CaMg(CO3)2):	121.168	0.658
Anhydrite (CaSO4) :	259.48	1.905

SampleID : Watir01
Location : Wadi Watir
Site : Furtaga-1
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Mg-Ca-Na-SO4-Cl

Sum of Anions (meq/l) : 20.80
Sum of Cations (meq/l) : 20.71
Balance: : 0.2%

Total dissolved solids : 41.5 meq/l 1358. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 15.4	77.00	43.12	770.0
Permanent hardness	: 11.89	59.46	33.30	594.6
Temporary hardness	: 3.51	17.54	9.82	175.4
Alkalinity	: 3.51	17.54	9.82	175.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	115.0	5.002	5.002	12.051
K +	12.0	0.307	0.307	0.74
Ca++	152.0	3.792	7.585	18.274
Mg++	95.0	3.908	7.816	18.831
Cl-	170.0	4.795	4.795	11.552
SO4--	600.0	6.246	12.493	30.099
HCO3-	214.0	3.508	3.508	8.452

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.6	0.97	0.319	0.194
Ca/SO4	0.253	0.607	0.152	0.364
Na/Cl	0.676	1.043	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.912	0.1353
Anhydrite (CaSO4)	:	850.754	6.246

SampleID	:	Watir02
Location	:	Wadi Watir
Site	:	Saleh Seleem
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Ca-Mg-Na-SO4-Cl
Sum of Anions (meq/l)	:	20.17
Sum of Cations (meq/l)	:	20.20
Balance:	:	0.1%

Total dissolved solids : 40.4 meq/l 1319.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	14.65	73.23	41.01	732.3
Permanent hardness	:	11.01	55.03	30.82	550.3
Temporary hardness	:	3.64	18.20	10.19	182.0
Alkalinity	:	3.64	18.20	10.19	182.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	123.0	5.35	5.35	13.251
K +	8.0	0.205	0.205	0.508
Ca++	155.0	3.867	7.735	19.158
Mg++	84.0	3.455	6.911	17.117
Cl-	189.0	5.331	5.331	13.204
SO4--	538.0	5.601	11.202	27.745
HCO3-	222.0	3.639	3.639	9.013

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.845	1.119	0.319	0.194
Ca/SO4	0.288	0.69	0.152	0.364
Na/Cl	0.651	1.004	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	8.797	0.1504
Anhydrite (CaSO4)	:	762.843	5.601

SampleID : Zaghara01
Location : Wadi Zaghara
Site : Dug Well
Sampling Date : Aug1997
Geology : Sand and G
Watertype : Na-Mg-Ca-Cl-HCO3-SO4

Sum of Anions (meq/l) : 11.77
Sum of Cations (meq/l) : 11.69
Balance: : 0.3%

Total dissolved solids : 23.5 meq/l 780. mg/l

Hardness	: meq/l	□<f	□<g	mg/l CaCO3
Total hardness	: 5.94	29.69	16.63	296.9
Permanent hardness	: 2.33	11.66	6.53	116.6
Temporary hardness	: 3.61	18.03	10.10	180.3
Alkalinity	: 3.61	18.03	10.10	180.3

(1 □<f = 10 mg/l CaCO3/l 1 □<g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	131.0	5.698	5.698	24.294
K +	2.0	0.051	0.051	0.217
Ca++	58.0	1.447	2.894	12.339
Mg++	37.0	1.522	3.044	12.978
Cl-	169.0	4.767	4.767	20.324
SO4--	163.0	1.697	3.394	14.47
HCO3-	220.0	3.606	3.606	15.374

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.568	0.951	0.319	0.194
Ca/SO4	0.356	0.853	0.152	0.364
Na/Cl	0.775	1.195	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.866	0.1345
Anhydrite (CaSO4)	:	231.121	1.697

SampleID	:	Zalaga01
Location	:	Wadi Zalaga
Site	:	Ainez Well
Sampling Date	:	Aug1997
Geology	:	Sand and G
Watertype	:	Mg-Ca-Na-SO4-Cl

Sum of Anions (meq/l)	:	32.77
Sum of Cations (meq/l)	:	32.57
Balance:	:	0.3%

Total dissolved solids	:	65.3 meq/l	2082. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	21.59	107.94	60.45	1079.4
Permanent hardness	:	17.64	88.19	49.39	881.9
Temporary hardness	:	3.95	19.75	11.06	197.5
Alkalinity	:	3.95	19.75	11.06	197.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	246.0	10.7	10.7	16.376
K +	11.0	0.281	0.281	0.43
Ca++	215.0	5.364	10.729	16.42
Mg++	132.0	5.43	10.86	16.62
Cl-	415.0	11.706	11.706	17.915
SO4--	822.0	8.558	17.115	26.193
HCO3-	241.0	3.95	3.95	6.045

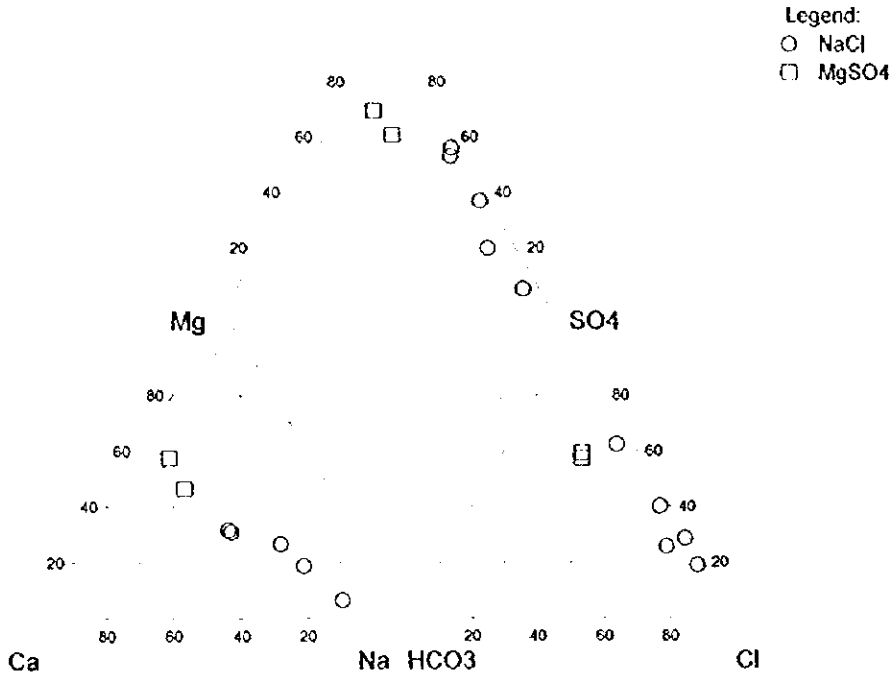
Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.629	0.988	0.319	0.194
Ca/SO4	0.262	0.627	0.152	0.364
Na/Cl	0.593	0.914	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	625.968	10.7003
Anhydrite (CaSO4)	:	1165.533	8.558

2.2 Water Quality on Upper Cretaceous Aquifer

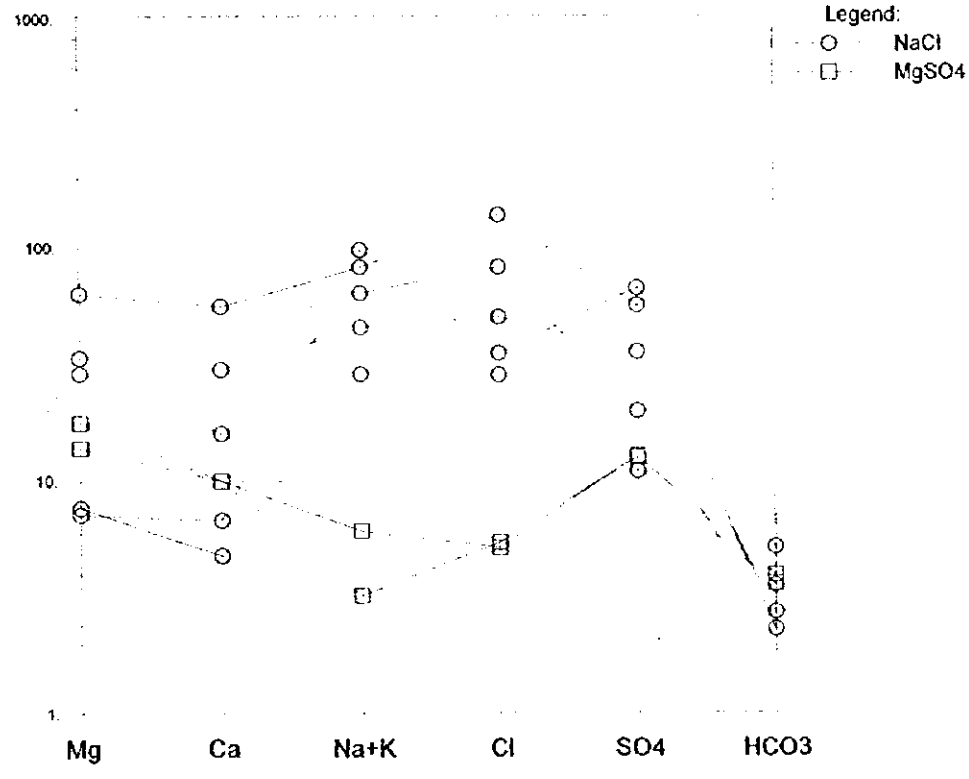
2.2.1 Piper Diagram and Schoeller Graph of Upper Creataceous Aquifer

Piper Diagram of Upper Cretaceous Groundwater Type



Schoeller Graph of Upper Cretaceous Groundwater Type

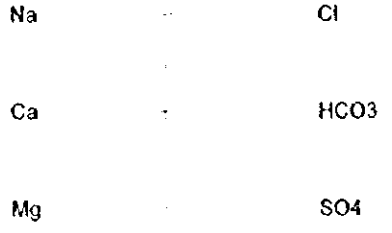
Concentration (meq/l)



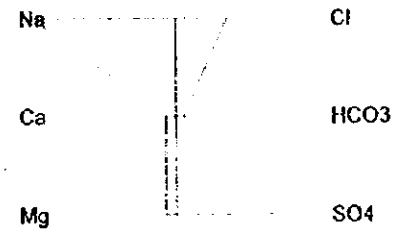
2.2.2 Stiff Diagrams of Upper Cretaceous Aquifer

Wadi Gharandar Gharandar-2 7

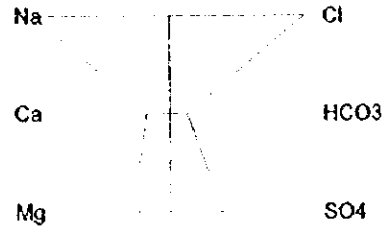
El Tih Plate JICA-1 8



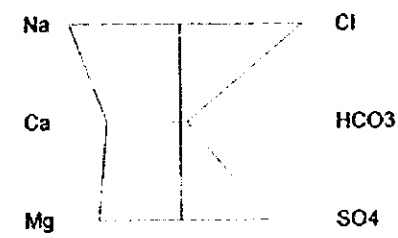
El Tih Plateau JICA-3 9



El Tih Plateau JICA-6 10

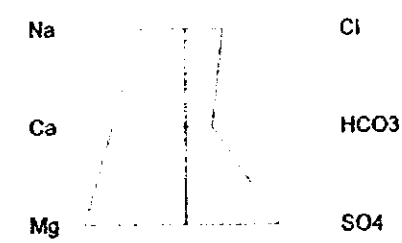


Rus Sudr Ain Abou Ragem 1

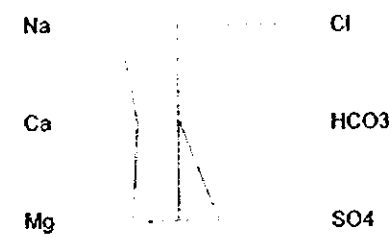


El Malha Abd Allah Seleman (1) 4

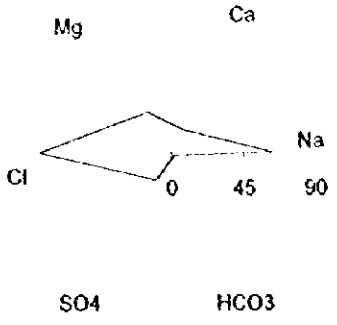
El Malha Abd Allah Seleman (2) 5



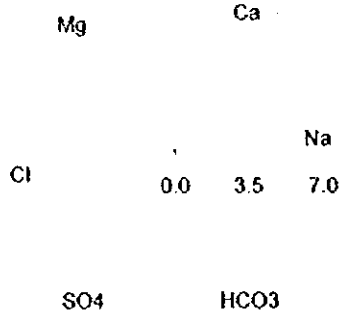
El Gharandar Hammam Faraoun 6



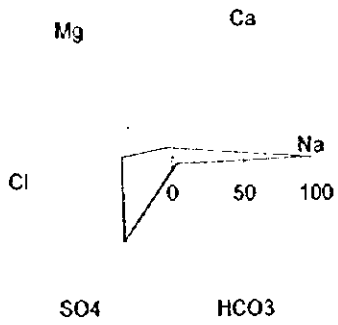
Wadi Gharandar Gharandar-2 7



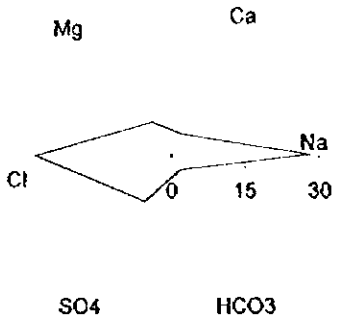
El Tih Plate JICA-1 8



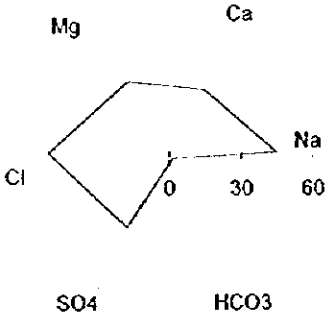
El Tih Plateau JICA-3 9



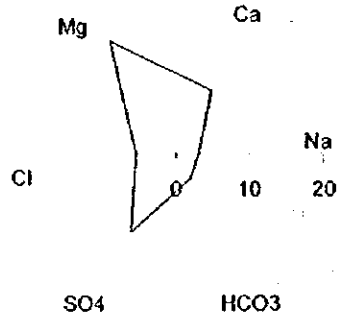
El Tih Plateau JICA-6 10



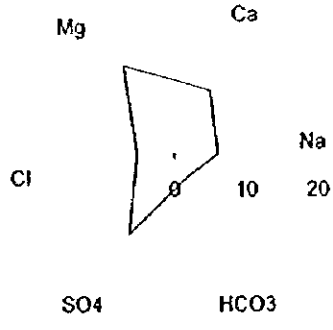
Rus Sudr Ain Abou Ragem 1



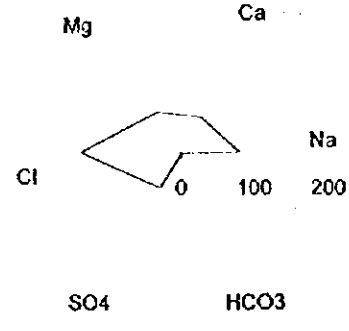
El Malha Abd Allah Seleman (1) 4



El Malha Abd Allah Seleman (2) 5



El Gharandar Hammam Faraoun 6



2.2.3 Water Quality Data Sheets of Upper Cretaceous Aquifer

Database: C:\programs\whi\AquaChem\Upper Creta.HC3

G2	Gharandar-2	Wadi Gharand	Lime Stone	Na-Mg-Cl	0007
JTW-1	JICA-1	El Tih Plate	Lime Stone		0008
JTW-3	JICA-3	El Tih Plate	Lime Stone	Na-SO4-Cl	0009
JTW-6	JICA-6	El Tih Plate	Lime Stone	Na-Cl-SO4	0010
Spr.1	Ain Abou Rag	Rus Sudr	Lime Stone	Na-Mg-Ca-Cl-SO4	0001
Spr.2	Abd Allah Se	El Malha	Lime Stone	Mg-Ca-SO4-Cl	0004
Spr.3	Abd Allah Se	El Malha	Lime Stone	Mg-Ca-Na-SO4-Cl	0005
Spr.4	Hammam Farao	El Gharandar	Lime Stone	Na-Mg-Ca-Cl-SO4	0006

SampleID	:	G2
Location	:	Wadi Gharandar
Site	:	Gharandar-2
Sampling Date	:	
Geology	:	Lime Stone
Watertype	:	Na-Mg-Cl
Sum of Anions (meq/l)	:	104.44
Sum of Cations (meq/l)	:	108.38
Balance:	:	1.9%
Total dissolved solids	:	212.8 meq/l 6153.6 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	44.68	223.40	125.11	2234.0
Permanent hardness	:	42.39	211.93	118.68	2119.3
Temporary hardness	:	2.3	11.48	6.43	114.8
Alkalinity	:	2.3	11.48	6.43	114.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1450.0	63.071	63.071	29.636
K +	24.6	0.629	0.629	0.296
Ca++	320.0	7.984	15.968	7.503
Mg++	349.0	14.356	28.712	13.491
Cl-	2920.0	82.363	82.363	38.701
SO4--	950.0	9.89	19.78	9.294
HCO3-	140.0	2.295	2.295	1.078

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.917	0.556	0.319	0.194
Ca/SO4	0.337	0.807	0.152	0.364
Na/Cl	0.497	0.766	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	3689.648	63.0709
Anhydrite (CaSO4)	:	1347.027	9.89

SampleID	:	JTW-3
Location	:	El Tih Plateau
Site	:	JICA-3
Sampling Date	:	25 May 9
Geology	:	Lime Stone
Watertype	:	Na-SO4-Cl
Sum of Anions (meq/l)	:	106.78
Sum of Cations (meq/l)	:	111.73
Balance:	:	2.3%

Total dissolved solids : 218.5 meq/l 7242.4 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	13.98	69.88	39.14	698.8
Permanent hardness	:	8.8	43.98	24.63	439.8
Temporary hardness	:	5.18	25.90	14.50	259.0
Alkalinity	:	5.18	25.90	14.50	259.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	2225.0	96.781	96.781	44.291
K +	38.0	0.972	0.972	0.445
Ca++	136.0	3.393	6.786	3.106
Mg++	87.4	3.595	7.19	3.29
Cl-	1240.0	34.976	34.976	16.006
SO4--	3200.0	33.314	66.628	30.491
HCO3-	316.0	5.18	5.18	2.371

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.556	0.944	0.319	0.194
Ca/SO4	0.043	0.102	0.152	0.364
Na/Cl	1.794	2.767	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	57.713	0.9865
Anhydrite (CaSO4)	:	4537.353	33.314

SampleID	:	JTW-6
Location	:	El Tih Plateau
Site	:	JICA-6
Sampling Date	:	9 Sep 97
Geology	:	Lime Stone
Watertype	:	Na-Cl-SO4
Sum of Anions (meq/l)	:	42.68
Sum of Cations (meq/l)	:	40.96
Balance:	:	2.0%
Total dissolved solids	:	83.6 meq/l 2589.1 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.47	62.33	34.91	623.3
Permanent hardness	:	8.93	44.63	24.99	446.3
Temporary hardness	:	3.54	17.70	9.91	177.0
Alkalinity	:	3.54	17.70	9.91	177.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	650.0	28.273	28.273	33.802
K +	8.8	0.225	0.225	0.269
Ca++	96.0	2.395	4.79	5.727
Mg++	93.3	3.838	7.676	9.177
Cl-	1000.0	28.206	28.206	33.722
SO4--	525.0	5.466	10.931	13.069
HCO3-	216.0	3.541	3.541	4.233

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.029	0.624	0.319	0.194
Ca/SO4	0.183	0.438	0.152	0.364
Na/Cl	0.65	1.002	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	46.543	0.7956
Anhydrite (CaSO4)	:	744.41	5.466

SampleID	:	Spr.1
Location	:	Rus Sudr
Site	:	Ain Abou Ragem
Sampling Date	:	20 Feb 9
Geology	:	Lime Stone
Watertype	:	Na-Mg-Ca-Cl-SO4
Sum of Anions (meq/l)	:	88.27
Sum of Cations (meq/l)	:	108.78
Balance:	:	10.4%
Total dissolved solids	:	197.1 meq/l 5697.1 mg/l

Hardness	:	meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	:	63.51	317.53	177.82	3175.3
Permanent hardness	:	60.79	303.93	170.20	3039.3
Temporary hardness	:	2.72	13.61	7.62	136.1
Alkalinity	:	2.72	13.61	7.62	136.1

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1035.0	45.02	45.02	22.847
K +	10.06	0.257	0.257	0.13
Ca++	600.0	14.97	29.94	15.194
Mg++	408.0	16.783	33.566	17.034
Cl-	1778.0	50.151	50.151	25.451
SO4--	1700.0	17.698	35.396	17.963
HCO3-	166.0	2.721	2.721	1.381

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.471	0.892	0.319	0.194
Ca/SO4	0.353	0.846	0.152	0.364
Na/Cl	0.582	0.898	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	2633.645	45.0196
Anhydrite (CaSO4)	:	2410.469	17.698

SampleID	:	Spr.2
Location	:	El Malha
Site	:	Abd Allah Seleman (1)
Sampling Date	:	20 Feb 9
Geology	:	Lime Stone
Watertype	:	Mg-Ca-SO4-Cl

Sum of Anions (meq/l)	:	21.85
Sum of Cations (meq/l)	:	30.97
Balance:	:	17.3%

Total dissolved solids	:	52.8 meq/l	1523.6 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	27.75	138.75	77.70	1387.5
Permanent hardness	:	23.82	119.08	66.69	1190.8
Temporary hardness	:	3.93	19.67	11.02	196.7
Alkalinity	:	3.93	19.67	11.02	196.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	71.99	3.131	3.131	5.928
K +	3.32	0.085	0.085	0.161
Ca++	200.0	4.99	9.98	18.895
Mg++	216.0	8.885	17.77	33.644
Cl-	192.3	5.424	5.424	10.269
SO4--	600.0	6.246	12.493	23.653
HCO3-	240.0	3.934	3.934	7.448

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.926	0.562	0.319	0.194
Ca/SO4	0.333	0.799	0.152	0.364
Na/Cl	0.374	0.577	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	183.185	3.1314
Anhydrite (CaSO4)	:	850.754	6.246

SampleID	:	Spr.3
Location	:	El Malha
Site	:	Abd Allah Seleman (2)
Sampling Date	:	20 Feb 9
Geology	:	Lime Stone
Watertype	:	Mg-Ca-Na-SO4-Cl

Sum of Anions (meq/l)	:	21.46
Sum of Cations (meq/l)	:	29.87
Balance:	:	16.4%

Total dissolved solids : 51.3 meq/l 1521.5 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	23.8	119.01	66.64	1190.1
Permanent hardness	:	20.2	100.98	56.55	1009.8
Temporary hardness	:	3.61	18.03	10.10	180.3
Alkalinity	:	3.61	18.03	10.10	180.3

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	138.0	6.003	6.003	11.694
K +	2.77	0.071	0.071	0.138
Ca++	200.0	4.99	9.98	19.441
Mg++	168.0	6.911	13.821	26.923
Cl-	182.7	5.153	5.153	10.038
SO4--	610.0	6.35	12.701	24.741
HCO3-	220.0	3.606	3.606	7.024

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.19	0.722	0.319	0.194
Ca/SO4	0.328	0.786	0.152	0.364
Na/Cl	0.755	1.165	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	8.503	0.1454
Anhydrite (CaSO4)	:	864.933	6.35

SampleID	:	Spr.4
Location	:	El Gharandar
Site	:	Hammam Faraoun
Sampling Date	:	20 Feb 9
Geology	:	Lime Stone
Watertype	:	Na-Mg-Ca-Cl-SO4

Sum of Anions (meq/l)	:	196.81
Sum of Cations (meq/l)	:	201.49
Balance:	:	1.2%

Total dissolved solids	:	398.3 meq/l	11558. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	119.07	595.36	333.40	5953.6
Permanent hardness	:	116.78	583.88	326.98	5838.8
Temporary hardness	:	2.3	11.48	6.43	114.8
Alkalinity	:	2.3	11.48	6.43	114.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	1849.0	80.426	80.426	20.192
K +	78.0	1.995	1.995	0.501
Ca++	1120.0	27.944	55.888	14.032
Mg++	768.0	31.592	63.184	15.863
Cl-	4903.0	138.296	138.296	34.721
SO4--	2700.0	28.109	56.217	14.114
HCO3-	140.0	2.295	2.295	0.576

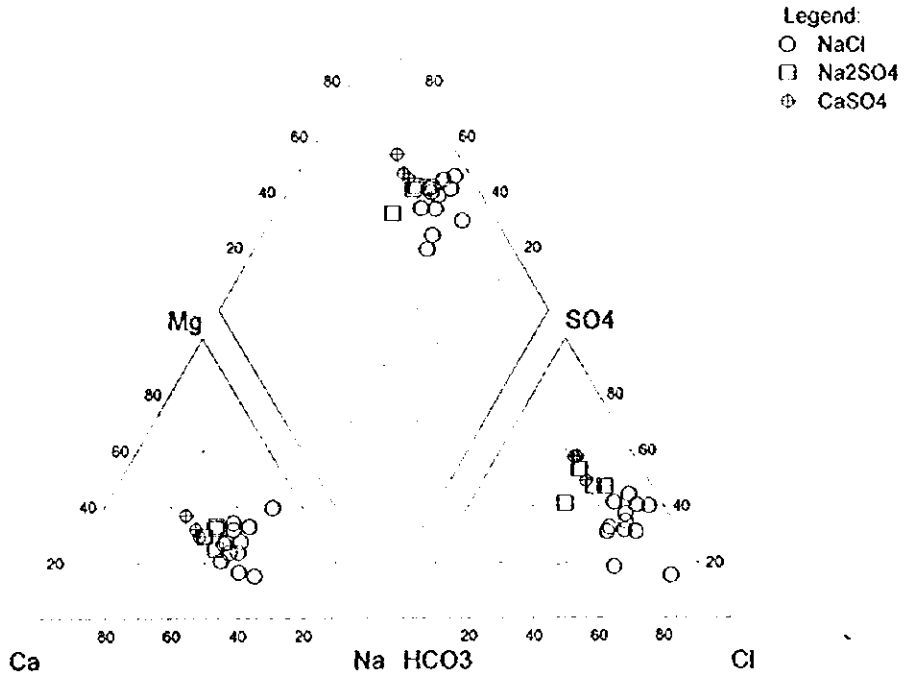
Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.458	0.885	0.319	0.194
Ca/SO4	0.415	0.994	0.152	0.364
Na/Cl	0.377	0.582	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	4704.937	80.4263
Anhydrite (CaSO4)	:	3828.392	28.109

2.3 Water Quality on Lower Cretaceous Aquifer

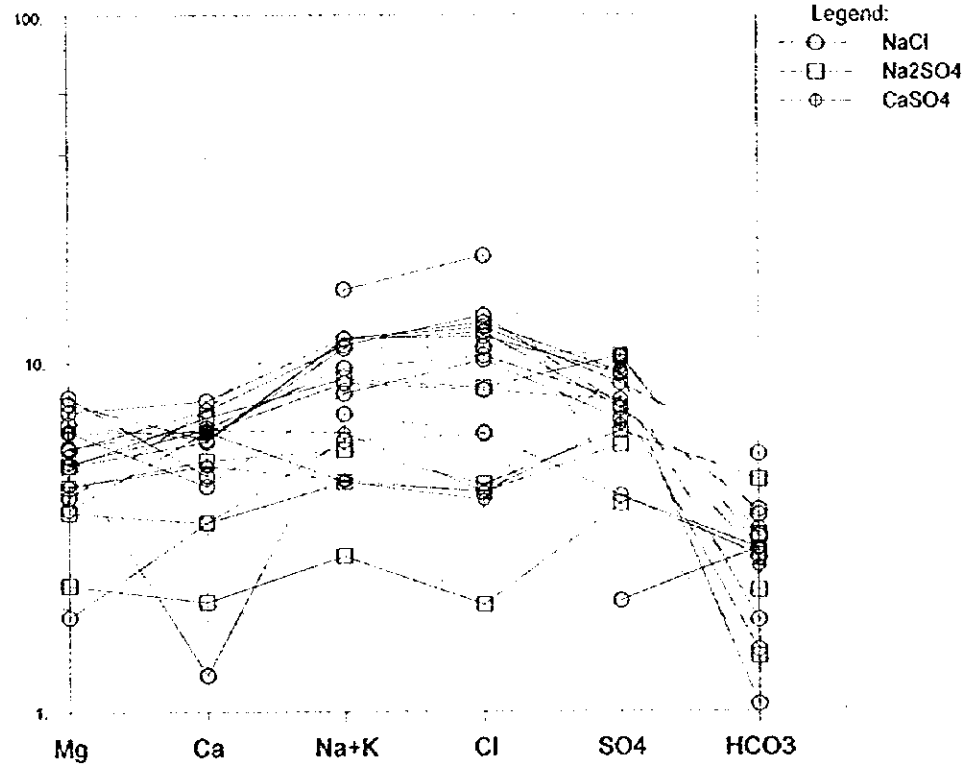
2.3.1 Piper Diagram and Schoeller Graph of Lower Cretaceous Aquifer

Piper Diagram of Lower Cretaceous Groundwater Type



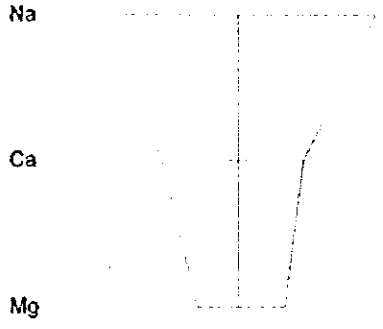
Schoeller Graph of Lower Cretaceous Groundwater Type

Concentration (meq/l)

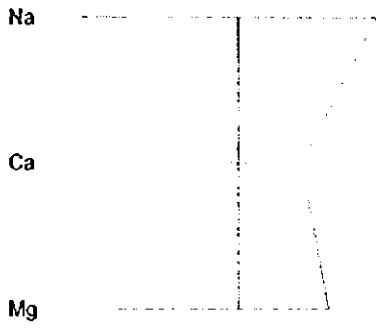


2.3.2 Stiff Diagrams of Lower Cretaceous Aquifer

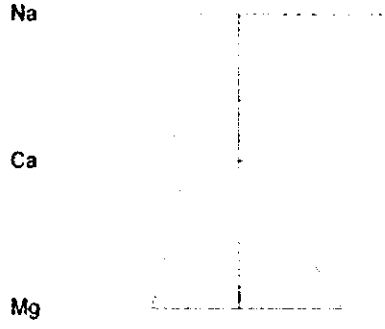
Wadi Feiran Feiran-1 14



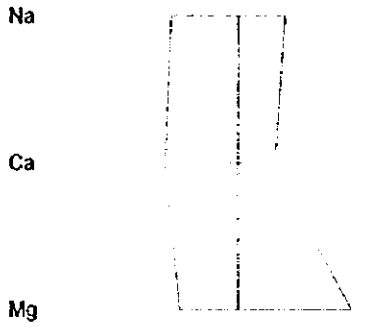
Wadi Feiran Feiran-2 13



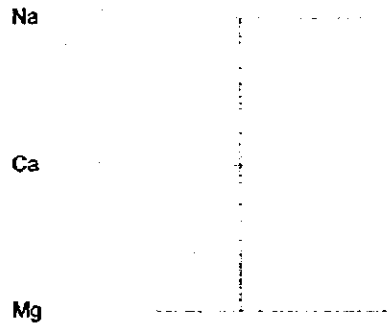
Wadi Gharandar Gharandal-1 15



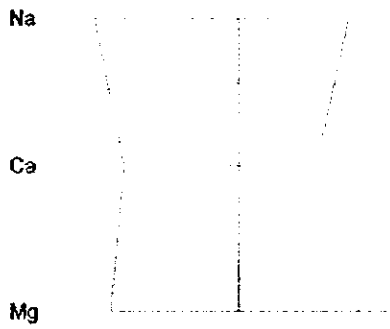
El Tih Plateau JICA-1 1



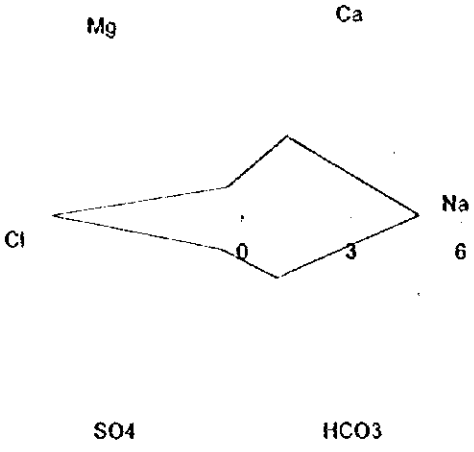
El Tih Plateau JICA-2 2



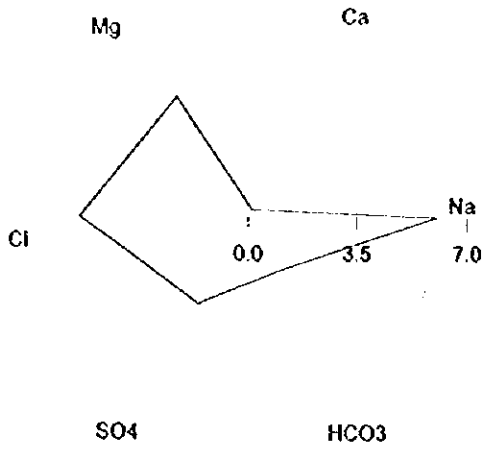
El Tih Plateau JICA-3 3



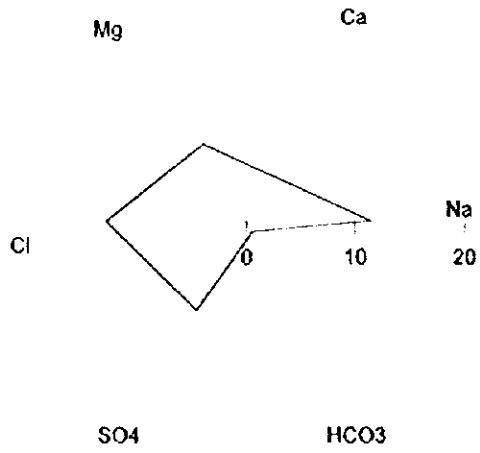
Wadi Feiran Feiran-1 14



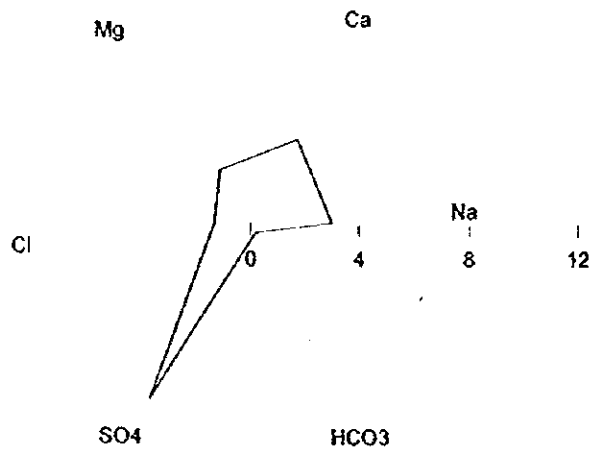
Wadi Feiran Feiran-2 13



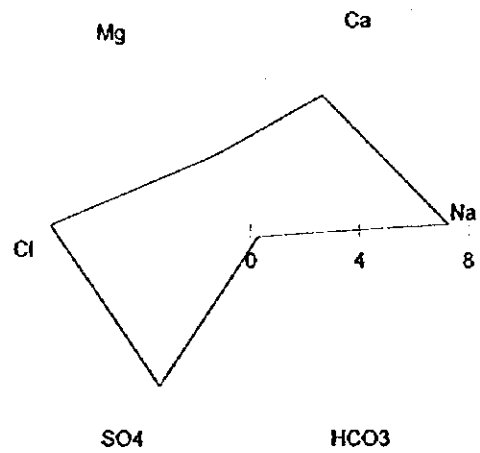
Wadi Gharandar Gharandal-1 15



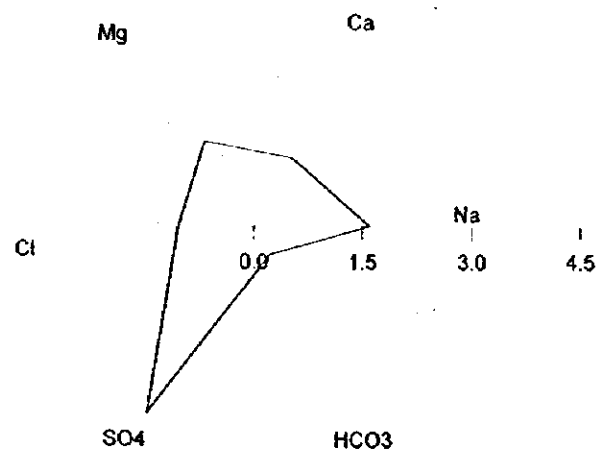
El Tih Plateau JICA-1 1



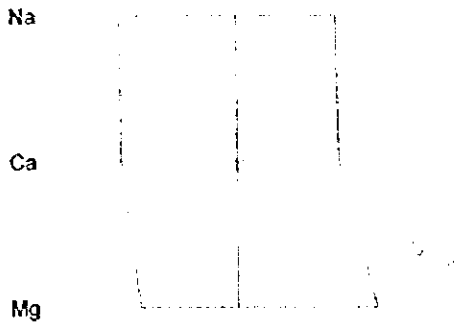
El Tih Plateau JICA-2 2



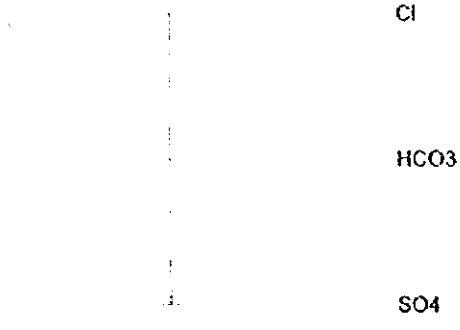
El Tih Plateau JICA-3 3



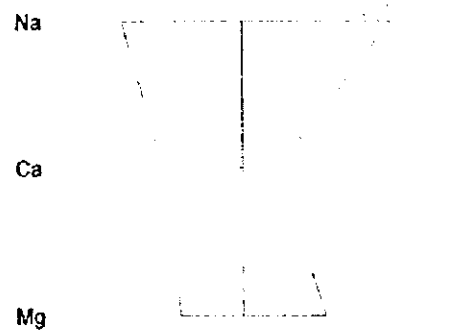
El Tih Plateau JICA-4 4



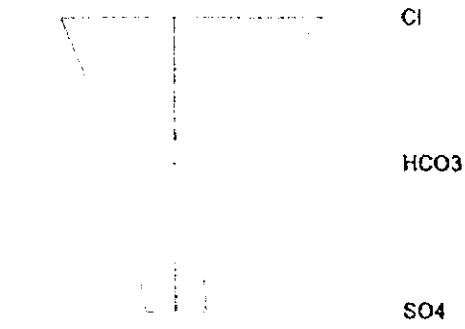
El Tih Plateau JICA-5 5



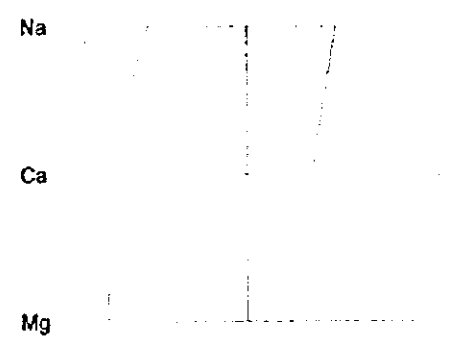
El Tih Plateau JICA-6 6



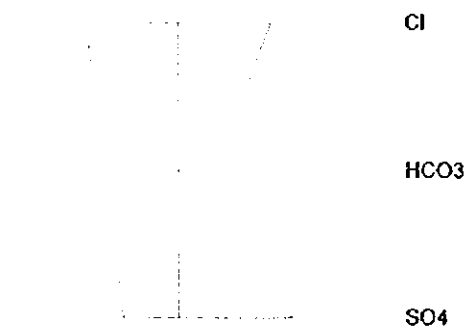
Nakhl Nakhl-1 8



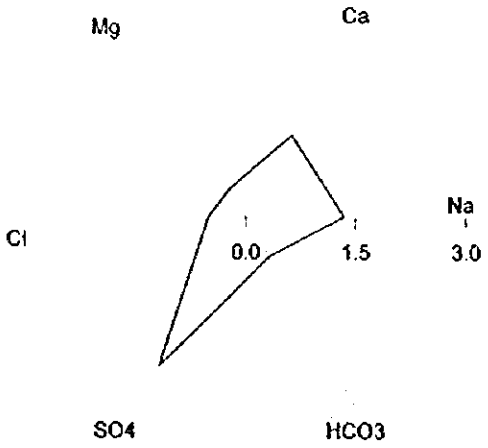
Nakhl Nakhl-2 7



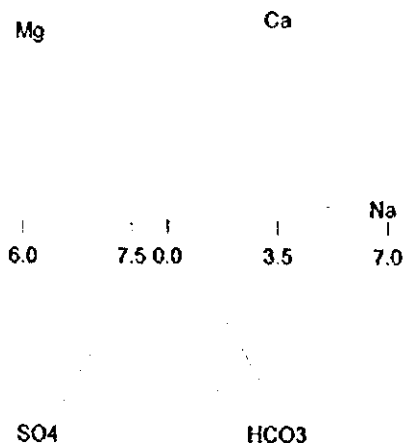
Nakhl Nakhl-4 9



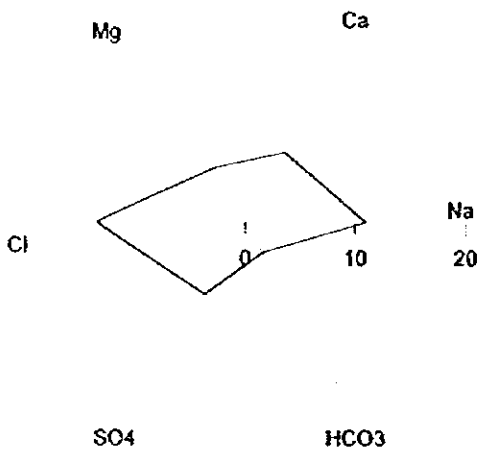
El Tih Plateau JICA-4 4



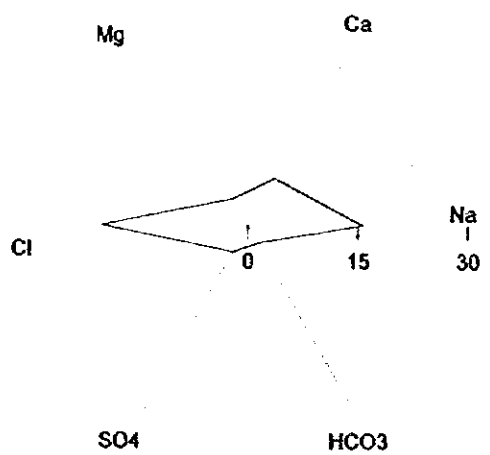
El Tih Plateau JICA-5 5



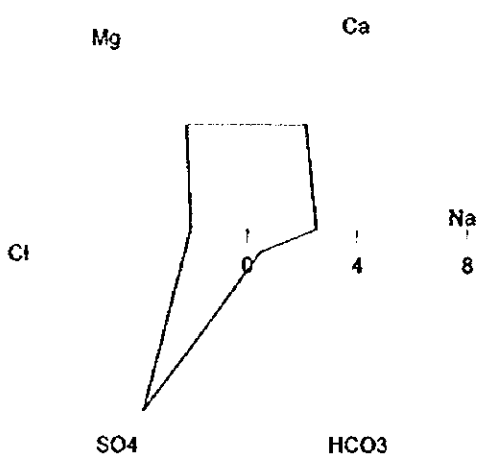
El Tih Plateau JICA-6 6



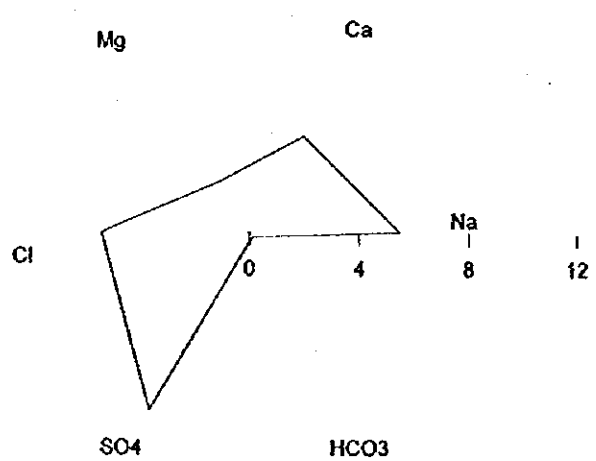
Nakhl Nakhl-1 8



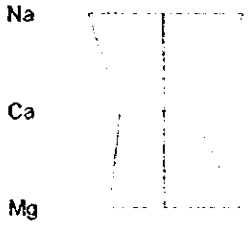
Nakhl Nakhl-2 7



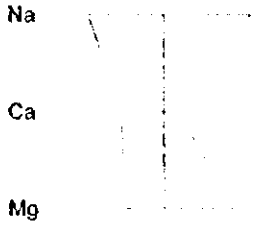
Nakhl Nakhl-4 9



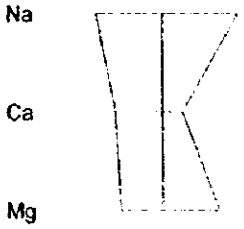
Nakhl Nakhl-5 10



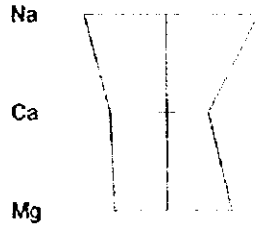
Nekhl Nakhl-6 20



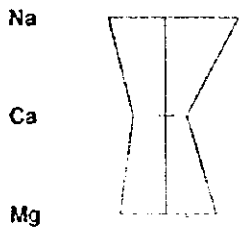
Nakhl Nakhl-7 11



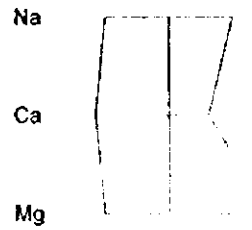
Nekhl Nekhl-8 (Temed 2) 19



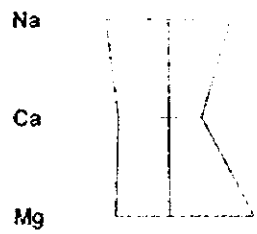
Wadi Sheira Sheira-1(K83) 18



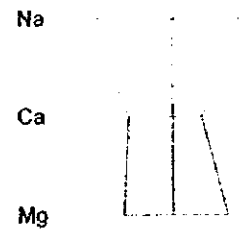
Wadi Sheira Sheira-3 (K52) 17



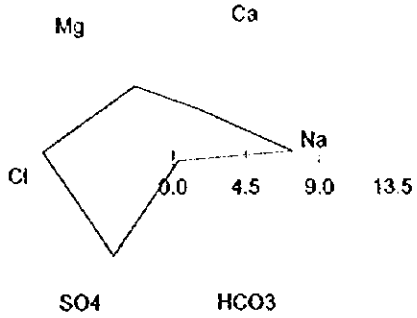
Wadi Sheira Sheira-4(K53) 16



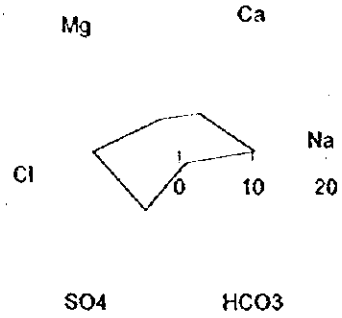
Themed Themed-1 12



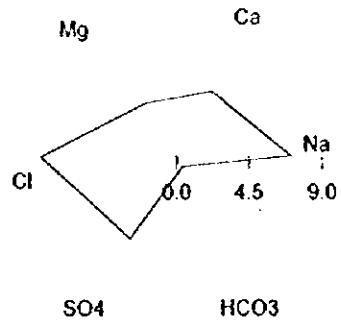
Nakhl Nakhl-5 10



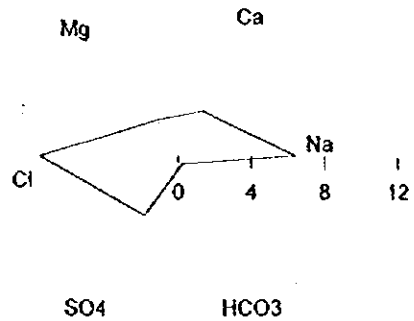
Nekhl Nakhl-6 20



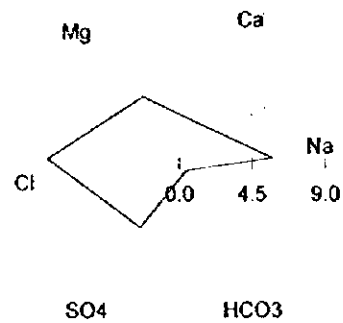
Nakhl Nakhl-7 11



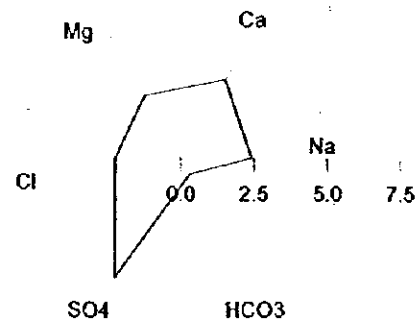
Nekhl Nekhl-8 (Temed 2) 19



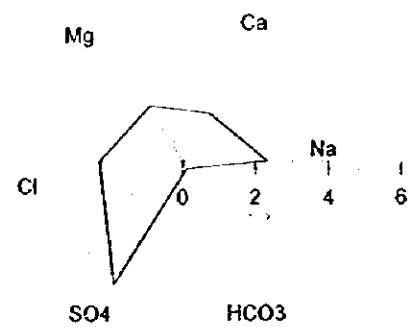
Wadi Sheira Sheira-1(K83) 18



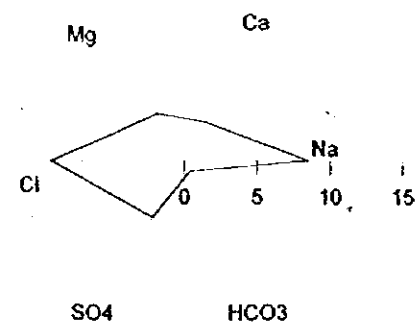
Wadi Sheira Sheira-3 (K52) 17



Wadi Sheira Sheira-4(K53) 16



Themed Themed-1 12



2.3.3 Water Quality Data Sheets of Lower Cretaceous Aquifer

Database: C:\programs\whi\AquaChem\Lower Creta.HC3

F1	Feiran-1	Wadi Feiran	Sand Stone	Na-Ca-Cl-HCO3	0014	(01)
F2	Feiran-2	Wadi Feiran	Sand Stone	Na-Mg-Cl-SO4-HC	0013	(01)
G1	Gharandal-1	Wadi Gharand	Sand Stone	Na-Mg-Ca-Cl-SO4	0015	(01)
J1	JICA-1	El Tih Plate	Sand Stone	Ca-Na-Mg-SO4-Cl	0001	(03)
J2	JICA-2	El Tih Plate	Sand Stone	Na-Ca-Mg-Cl-SO4	0002	(01)
J3	JICA-3	El Tih Plate	Sand Stone	Na-Mg-Ca-SO4-Cl	0003	(02)
J4	JICA-4	El Tih Plate	Sand Stone	Na-Ca-Mg-SO4-HC	0004	(02)
J5	JICA-5	El Tih Plate	Sand Stone		0005	
J6	JICA-6	El Tih Plate	Sand Stone	Na-Ca-Mg-Cl-SO4	0006	(01)
N1	Nakhl-1	Nakhl	Sand Stone	Na-Ca-Cl	0008	(01)
N2	Nakhl-2	Nakhl	Sand Stone	Ca-Mg-Na-SO4-Cl	0007	(03)
N4	Nakhl-4	Nakhl	Sand Stone	Na-Ca-Mg-SO4-Cl	0009	(02)
N5	Nakhl-5	Nakhl	Sand Stone	Na-Mg-Ca-Cl-SO4	0010	(01)
N6	Nakhl-6	Nekhl	Sand Stone	Na-Ca-Mg-Cl-SO4	0020	(01)
N7	Nakhl-7	Nakhl	Sand Stone	Na-Ca-Mg-Cl-SO4	0011	(01)
N8	Nekhl-8 (Tem	Nekhl	Sand Stone	Na-Ca-Mg-Cl-SO4	0019	(01)
S1	Sheira-1(K83	Wadi Sheira	Sand Stone	Na-Mg-Ca-Cl-SO4	0018	(01)
S3	Sheira-3 (K5	Wadi Sheira	Sand Stone	Ca-Mg-Na-SO4-Cl	0017	(03)
S4	Sheira-4(K53	Wadi Sheira	Sand Stone	Na-Mg-Ca-SO4-Cl	0016	(02)
T1	Themed-1	Themed	Sand Stone	Na-Mg-Ca-Cl-SO4	0012	(01)

SampleID : F1
Location : Wadi Feiran
Site : Feiran-1
Sampling Date :
Geology : Sand Stone
Watertype : Na-Ca-Cl-HCO3

Sum of Anions (meq/l) : 11.29
Sum of Cations (meq/l) : 11.41
Balance: : 0.5%

Total dissolved solids : 22.7 meq/l 736.1 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 5.39	26.94	15.09	269.4
Permanent hardness	: 2.44	12.19	6.83	121.9
Temporary hardness	: 2.95	14.75	8.26	147.5
Alkalinity	: 2.95	14.75	8.26	147.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	135.0	5.872	5.872	25.86
K +	5.9	0.151	0.151	0.665
Ca++	70.4	1.756	3.513	15.471
Mg++	22.8	0.938	1.876	8.262
Cl-	222.0	6.262	6.262	27.578
SO4--	100.0	1.041	2.082	9.169
HCO3-	180.0	2.95	2.95	12.992

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	3.088	1.873	0.319	0.194
Ca/SO4	0.704	1.687	0.152	0.364
Na/Cl	0.608	0.938	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	343.519	5.8721
Dolomite (CaMg(CO3)2):	172.665	0.938
Anhydrite (CaSO4) :	141.792	1.041

SampleID : F2
Location : Wadi Feiran
Site : Feiran-2
Sampling Date :
Geology : Sand Stone
Watertype : Na-Mg-Cl-SO4-HCO3

Sum of Anions (meq/l) : 13.43
Sum of Cations (meq/l) : 13.88
Balance: : 1.6%

Total dissolved solids : 27.3 meq/l 862.3 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 6.72	33.59	18.81	335.9
Permanent hardness	: 3.77	18.83	10.55	188.3
Temporary hardness	: 2.95	14.75	8.26	147.5
Alkalinity	: 2.95	14.75	8.26	147.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	162.0	7.047	7.047	25.799
K +	4.6	0.118	0.118	0.432
Ca++	25.6	0.639	1.277	4.675
Mg++	66.12	2.72	5.44	19.916
Cl-	224.0	6.318	6.318	23.13
SO4--	200.0	2.082	4.164	15.245
HCO3-	180.0	2.95	2.95	10.8

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.387	0.235	0.319	0.194
Ca/SO4	0.128	0.307	0.152	0.364
Na/Cl	0.723	1.115	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	10.426	0.1782
Anhydrite (CaSO4)	:	283.585	2.082

Sample ID : G1
Location : Wadi Gharandar
Site : Gharandal-1
Sampling Date :
Geology : Sand Stone
Watertype : Na-Mg-Ca-Cl-SO4

Sum of Anions (meq/l) : 23.39
Sum of Cations (meq/l) : 24.50
Balance: : 2.3%

Total dissolved solids : 47.9 meq/l 1439.3 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 12.79	63.94	35.80	639.4
Permanent hardness	: 11.74	58.69	32.87	586.9
Temporary hardness	: 1.05	5.25	2.94	52.5
Alkalinity	: 1.05	5.25	2.94	52.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	265.0	11.527	11.527	24.07
K +	7.1	0.182	0.182	0.38
Ca++	96.0	2.395	4.79	10.002
Mg++	97.2	3.998	7.997	16.699
Cl-	460.0	12.975	12.975	27.094
SO4--	450.0	4.685	9.37	19.566
HCO3-	64.0	1.049	1.049	2.19

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.988	0.599	0.319	0.194
Ca/SO4	0.213	0.511	0.152	0.364
Na/Cl	0.576	0.888	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	674.315	11.5268
Anhydrite (CaSO4) :	638.065	4.685

SampleID : JTW-1
Location : El Tih Plateau
Site : JICA-1
Sampling Date : 10 Jan 1
Geology : Sand Stone
Watertype : Ca-Na-Mg-SO4-Cl

Sum of Anions (meq/l) : 18.09
Sum of Cations (meq/l) : 18.01
Balance: : 0.2%

Total dissolved solids : 36.1 meq/l 1203.1 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 11.67	58.35	32.68	583.5
Permanent hardness	: 8.28	41.38	23.17	413.8
Temporary hardness	: 3.39	16.97	9.50	169.7
Alkalinity	: 3.39	16.97	9.50	169.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	138.0	6.003	6.003	16.628
K +	13.0	0.332	0.332	0.92
Ca++	130.0	3.244	6.487	17.969
Mg++	63.0	2.592	5.183	14.357
Cl-	152.0	4.287	4.287	11.875
SO4--	500.0	5.205	10.411	28.838
HCO3-	207.0	3.393	3.393	9.399

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.063	1.252	0.319	0.194
Ca/SO4	0.26	0.623	0.152	0.364
Na/Cl	0.908	1.4	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.074	0.1209
Anhydrite (CaSO4)	:	708.961	5.205

SampleID	:	JTW-2
Location	:	El Tih Plateau
Site	:	JICA-2
Sampling Date	:	15 Aug 1
Geology	:	Sand Stone
Watertype	:	Na-Ca-Mg-Cl-SO4
Sum of Anions (meq/l)	:	17.67
Sum of Cations (meq/l)	:	18.99
Balance:	:	3.6%
Total dissolved solids	:	36.7 meq/l 1147.2 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	10.23	51.13	28.63	511.3
Permanent hardness	:	8.72	43.58	24.41	435.8
Temporary hardness	:	1.51	7.54	4.22	75.4
Alkalinity	:	1.51	7.54	4.22	75.4

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	190.0	8.264	8.264	22.546
K +	19.5	0.499	0.499	1.361
Ca++	128.0	3.194	6.387	17.425
Mg++	46.65	1.919	3.838	10.471
Cl-	296.0	8.349	8.349	22.778
SO4--	375.0	3.904	7.808	21.302
HCO3-	92.0	1.508	1.508	4.114

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.744	1.664	0.319	0.194
Ca/SO4	0.341	0.818	0.152	0.364
Na/Cl	0.642	0.99	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	483.471	8.2645
Anhydrite (CaSO4)	:	531.721	3.904

SampleID	:	JIW-3
Location	:	El Tih Plateau
Site	:	JICA-3
Sampling Date	:	25 May 9
Geology	:	Sand Stone
Watertype	:	Na-Mg-Ca-SO4-Cl
Sum of Anions (meq/l)	:	7.43
Sum of Cations (meq/l)	:	7.21
Balance:	:	1.5%
Total dissolved solids	:	14.6 meq/l 487.6 mg/l

Hardness	:	meq/l	□f	□g	mg/l CaCO3
Total hardness	:	4.4	21.98	12.31	219.8
Permanent hardness	:	2.95	14.77	8.27	147.7
Temporary hardness	:	1.44	7.21	4.04	72.1
Alkalinity	:	1.44	7.21	4.04	72.1

(1 □f = 10 mg/l CaCO3/l 1 □g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	60.0	2.61	2.61	17.834
K +	7.8	0.199	0.199	1.36
Ca++	41.6	1.038	2.076	14.185
Mg++	28.2	1.16	2.32	15.853
Cl-	72.0	2.031	2.031	13.878
SO4--	190.0	1.978	3.956	27.031
HCO3-	88.0	1.442	1.442	9.853

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.475	0.895	0.319	0.194
Ca/SO4	0.219	0.525	0.152	0.364
Na/Cl	0.833	1.285	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	3.351	0.0573
Anhydrite (CaSO4)	:	269.405	1.978

SampleID	:	JTW-4
Location	:	El Tih Plateau
Site	:	JICA-4
Sampling Date	:	10 Jan 1
Geology	:	Sand Stone
Watertype	:	Na-Ca-Mg-SO4-HCO3-Cl

Sum of Anions (meq/l)	:	15.52
Sum of Cations (meq/l)	:	15.40
Balance:	:	0.4%

Total dissolved solids	:	30.9 meq/l	1044.3 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	9.73	48.66	27.25	486.6
Permanent hardness	:	5.09	25.46	14.26	254.6
Temporary hardness	:	4.64	23.20	12.99	232.0
Alkalinity	:	4.64	23.20	12.99	232.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	123.0	5.35	5.35	17.302
K +	12.0	0.307	0.307	0.993
Ca++	106.0	2.645	5.289	17.104
Mg++	54.0	2.221	4.443	14.368
Cl-	160.0	4.513	4.513	14.595
SO4--	306.0	3.186	6.371	20.603
HCO3-	283.0	4.639	4.639	15.002

Ratios	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.963	1.191	0.319	0.194
Ca/SO4	0.346	0.83	0.152	0.364
Na/Cl	0.769	1.185	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.447	0.1273
Anhydrite (CaSO4)	:	433.884	3.186

SampleID : JTW-6
Location : El Tih Plateau
Site : JICA-6
Sampling Date :
Geology : Sand Stone
Watertype : Na-Ca-Mg-Cl-SO4

Sum of Anions (meq/l) : 24.32
Sum of Cations (meq/l) : 24.23
Balance: : 0.2%

Total dissolved solids : 48.5 meq/l 1515.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 13.01	65.06	36.43	650.6
Permanent hardness	: 9.83	49.16	27.53	491.6
Temporary hardness	: 3.18	15.90	8.90	159.0
Alkalinity	: 3.18	15.90	8.90	159.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	253.0	11.005	11.005	22.669
K +	8.0	0.205	0.205	0.422
Ca++	147.0	3.668	7.335	15.109
Mg++	69.0	2.838	5.677	11.694
Cl-	483.0	13.624	13.624	28.064
SO4--	361.0	3.758	7.516	15.482
HCO3-	194.0	3.18	3.18	6.55

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.13	1.292	0.319	0.194
Ca/SO4	0.407	0.976	0.152	0.364
Na/Cl	0.524	0.808	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	643.78	11.0048
Anhydrite (CaSO4) :	511.87	3.758

SampleID : REGWA N1
Location : Nakhl
Site : Nakhl-1
Sampling Date :
Geology : Sand Stone
Watertype : Na-Ca-Cl

Sum of Anions (meq/l) : 27.69
Sum of Cations (meq/l) : 27.76
Balance: : 0.1%

Total dissolved solids : 55.5 meq/l 1685. mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 11.51	57.57	32.24	575.7
Permanent hardness	: 8.3	41.48	23.23	414.8
Temporary hardness	: 3.22	16.10	9.01	161.0
Alkalinity	: 3.22	16.10	9.01	161.0

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	360.0	15.659	15.659	28.238
K +	23.0	0.588	0.588	1.06
Ca++	147.5	3.68	7.36	13.272
Mg++	50.5	2.077	4.155	7.493
Cl-	720.0	20.309	20.309	36.623
SO4--	200.0	2.082	4.164	7.509
HCO3-	172.0	2.819	2.819	5.083

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.921	1.772	0.319	0.194
Ca/SO4	0.738	1.767	0.152	0.364
Na/Cl	0.5	0.771	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	916.05	15.659
Dolomite (CaMg(CO3)2)	:	382.437	2.077
Anhydrite (CaSO4)	:	283.585	2.082

SampleID	:	REGWA-N2
Location	:	Nakhl
Site	:	Nakhl-2
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Ca-Mg-Na-SO4-Cl
Sum of Anions (meq/l)	:	16.59
Sum of Cations (meq/l)	:	17.34
Balance:	:	2.2%
Total dissolved solids	:	33.9 meq/l 1095.9 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.75	63.77	35.71	637.7
Permanent hardness	:	9.8	49.02	27.45	490.2
Temporary hardness	:	2.95	14.75	8.26	147.5
Alkalinity	:	2.95	14.75	8.26	147.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	104.0	4.524	4.524	13.332
K +	2.5	0.064	0.064	0.189
Ca++	128.0	3.194	6.387	18.822
Mg++	77.4	3.184	6.368	18.766
Cl-	144.0	4.062	4.062	11.971
SO4--	460.0	4.789	9.578	28.226
HCO3-	180.0	2.95	2.95	8.694

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.654	1.003	0.319	0.194
Ca/SO4	0.278	0.667	0.152	0.364
Na/Cl	0.722	1.114	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	6.702	0.1146
Anhydrite (CaSO4)	:	652.245	4.789

SampleID	:	REGWA-N4
Location	:	Nakhl
Site	:	Nakhl-4
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Ca-Mg-SO4-Cl

Sum of Anions (meq/l)	:	22.09
Sum of Cations (meq/l)	:	21.15
Balance:	:	2.28

Total dissolved solids	:	43.2 meq/l	1414.8 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.12	60.62	33.95	606.2
Permanent hardness	:	8.91	44.55	24.95	445.5
Temporary hardness	:	3.21	16.07	9.00	160.7
Alkalinity	:	3.21	16.07	9.00	160.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	195.0	8.482	8.482	19.619
K +	21.2	0.542	0.542	1.254
Ca++	140.4	3.503	7.006	16.205
Mg++	62.2	2.559	5.117	11.836
Cl-	300.0	8.462	8.462	19.573
SO4--	500.0	5.205	10.411	24.081
HCO3-	196.0	3.213	3.213	7.432

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	2.257	1.369	0.319	0.194
Ca/SO4	0.281	0.673	0.152	0.364
Na/Cl	0.65	1.002	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	13.963	0.2387
Anhydrite (CaSO4)	:	708.961	5.205

SampleID	:	REGWA-N5
Location	:	Nakhl
Site	:	Nakhl-5
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Mg-Ca-Cl-SO4

Sum of Anions (meq/l)	:	25.14
Sum of Cations (meq/l)	:	24.75
Balance:	:	0.8%

Total dissolved solids	:	49.9 meq/l	1592.9 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	13.74	68.72	38.48	687.2
Permanent hardness	:	10.07	50.36	28.20	503.6
Temporary hardness	:	3.67	18.36	10.28	183.6
Alkalinity	:	3.67	18.36	10.28	183.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	240.0	10.439	10.439	20.926
K +	22.0	0.563	0.563	1.129
Ca++	121.6	3.034	6.068	12.164
Mg++	93.3	3.838	7.676	15.387
Cl-	392.0	11.057	11.057	22.165
SO4--	500.0	5.205	10.411	20.87
HCO3-	224.0	3.672	3.672	7.361

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.303	0.791	0.319	0.194
Ca/SO4	0.243	0.583	0.152	0.364
Na/Cl	0.612	0.944	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	610.7	10.4393
Anhydrite (CaSO4)	:	708.961	5.205

SampleID : N6
Location : Nekhl
Site : Nakhl-6
Sampling Date :
Geology : Sand Stone
Watertype : Na-Ca-Mg-Cl-SO4

Sum of Anions (meq/l) : 22.95
Sum of Cations (meq/l) : 22.82
Balance: : 0.3%

Total dissolved solids : 45.8 meq/l 1449.2 mg/l

Hardness	: meq/l	°f	°g	mg/l CaCO3
Total hardness	: 11.11	55.53	31.10	555.3
Permanent hardness	: 9.27	46.35	25.96	463.5
Temporary hardness	: 1.84	9.18	5.14	91.8
Alkalinity	: 1.84	9.18	5.14	91.8

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	240.0	10.439	10.439	22.806
K +	50.0	1.279	1.279	2.794
Ca++	120.0	2.994	5.988	13.082
Mg++	62.21	2.559	5.118	11.181
Cl-	420.0	11.847	11.847	25.882
SO4--	445.0	4.633	9.265	20.241
HCO3-	112.0	1.836	1.836	4.011

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.929	1.17	0.319	0.194
Ca/SO4	0.27	0.646	0.152	0.364
Na/Cl	0.571	0.881	0.556	0.858

Dissolved Minerals:	mg/l	mmol/l
Halite (NaCl) :	610.7	10.4393
Anhydrite (CaSO4) :	630.976	4.633

SampleID	:	REGWA-N7
Location	:	Nakhl
Site	:	Nakhl-7
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Ca-Mg-Cl-SO4
Sum of Anions (meq/l)	:	21.00
Sum of Cations (meq/l)	:	21.97
Balance:	:	2.3%
Total dissolved solids	:	43.0 meq/l 1345. mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.3	61.52	34.45	615.2
Permanent hardness	:	9.55	47.75	26.74	477.5
Temporary hardness	:	2.75	13.77	7.71	137.7
Alkalinity	:	2.75	13.77	7.71	137.7

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	210.0	9.134	9.134	21.257
K +	20.8	0.532	0.532	1.238
Ca++	131.2	3.273	6.547	15.237
Mg++	69.98	2.879	5.757	13.398
Cl-	370.0	10.436	10.436	24.287
SO4--	375.0	3.904	7.808	18.171
HCO3-	168.0	2.754	2.754	6.409

Ratios

	mg/l	mmol/l	Comparison to Seawater mg/l	mmol/l
Ca/Mg	1.875	1.137	0.319	0.194
Ca/SO4	0.35	0.838	0.152	0.364
Na/Cl	0.568	0.875	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	534.363	9.1344
Anhydrite (CaSO4)	:	531.721	3.904

SampleID	:	N8
Location	:	Nekhl
Site	:	Nekhl-8 (Temed 2)
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Ca-Mg-Cl-SO4-HCO3

Sum of Anions (meq/l)	:	26.82
Sum of Cations (meq/l)	:	26.81
Balance:	:	0.0%

Total dissolved solids	:	53.6 meq/l	1720.4 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	15.09	75.46	42.26	754.6
Permanent hardness	:	9.6	48.00	26.88	480.0
Temporary hardness	:	5.49	27.46	15.38	274.6
Alkalinity	:	5.49	27.46	15.38	274.6

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	262.1	11.401	11.401	21.259
K +	12.5	0.32	0.32	0.597
Ca++	156.7	3.91	7.819	14.58
Mg++	88.4	3.636	7.273	13.562
Cl-	446.9	12.605	12.605	23.504
SO4--	418.8	4.36	8.72	16.26
HCO3-	335.0	5.491	5.491	10.239

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.773	1.075	0.319	0.194
Ca/SO4	0.374	0.897	0.152	0.364
Na/Cl	0.586	0.904	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	666.936	11.4006
Anhydrite (CaSO4)	:	593.826	4.36

SampleID	:	S1
Location	:	Wadi Sheira
Site	:	Sheira-1(K83)
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Mg-Ca-Cl-SO4
Sum of Anions (meq/l)	:	19.91
Sum of Cations (meq/l)	:	19.07
Balance:	:	2.2%
Total dissolved solids	:	39.0 meq/l 1227.8 mg/l

Hardness	:	meq/l	□◁f	□◁g	mg/l CaCO3
Total hardness	:	10.87	54.34	30.43	543.4
Permanent hardness	:	7.98	39.92	22.35	399.2
Temporary hardness	:	2.89	14.43	8.08	144.3
Alkalinity	:	2.89	14.43	8.08	144.3

(1 □◁f = 10 mg/l CaCO3/l 1 □◁g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	180.0	7.829	7.829	20.086
K +	14.4	0.368	0.368	0.944
Ca++	89.6	2.236	4.471	11.471
Mg++	77.76	3.199	6.397	16.412
Cl-	360.0	10.154	10.154	26.051
SO4--	330.0	3.435	6.871	17.628
HCO3-	176.0	2.885	2.885	7.402

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.152	0.699	0.319	0.194
Ca/SO4	0.272	0.651	0.152	0.364
Na/Cl	0.5	0.771	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	458.025	7.8295
Anhydrite (CaSO4)	:	467.915	3.435

SampleID	:	S3
Location	:	Wadi Sheira
Site	:	Sheira-3 (K52)
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Ca-Mg-Na-SO4-Cl

Sum of Anions (meq/l)	:	13.57
Sum of Cations (meq/l)	:	14.22
Balance:	:	2.3%

Total dissolved solids	:	27.8 meq/l	898.6 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	9.59	47.93	26.84	479.3
Permanent hardness	:	6.96	34.81	19.49	348.1
Temporary hardness	:	2.62	13.11	7.34	131.1
Alkalinity	:	2.62	13.11	7.34	131.1

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	102.0	4.437	4.437	15.964
K +	7.8	0.199	0.199	0.716
Ca++	102.4	2.555	5.11	18.385
Mg++	54.4	2.238	4.476	16.104
Cl-	152.0	4.287	4.287	15.424
SO4--	320.0	3.331	6.663	23.972
HCO3-	160.0	2.623	2.623	9.437

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.882	1.142	0.319	0.194
Ca/SO4	0.32	0.767	0.152	0.364
Na/Cl	0.671	1.035	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.074	0.1209
Anhydrite (CaSO4)	:	453.735	3.331

SampleID	:	S4
Location	:	Wadi Sheira
Site	:	Sheira-4(K53)
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Mg-Ca-SO4-Cl
Sum of Anions (meq/l)	:	12.35
Sum of Cations (meq/l)	:	11.84
Balance:	:	2.1%
Total dissolved solids	:	24.2 meq/l 792.8 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	7.26	36.32	20.34	363.2
Permanent hardness	:	5.03	25.17	14.10	251.7
Temporary hardness	:	2.23	11.15	6.24	111.5
Alkalinity	:	2.23	11.15	6.24	111.5

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	100.0	4.35	4.35	17.986
K +	8.8	0.225	0.225	0.93
Ca++	70.4	1.756	3.513	14.525
Mg++	45.6	1.876	3.752	15.513
Cl-	152.0	4.287	4.287	17.725
SO4--	280.0	2.915	5.83	24.105
HCO3-	136.0	2.229	2.229	9.216

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.544	0.936	0.319	0.194
Ca/SO4	0.251	0.603	0.152	0.364
Na/Cl	0.658	1.015	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	7.074	0.1209
Anhydrite (CaSO4)	:	397.018	2.915

SampleID	:	T1
Location	:	Themed
Site	:	Themed-1
Sampling Date	:	
Geology	:	Sand Stone
Watertype	:	Na-Mg-Ca-Cl-SO4
Sum of Anions (meq/l)	:	23.38
Sum of Cations (meq/l)	:	24.42
Balance:	:	2.2%
Total dissolved solids	:	47.8 meq/l 1491.4 mg/l

Hardness	:	meq/l	°f	°g	mg/l CaCO3
Total hardness	:	12.79	63.93	35.80	639.3
Permanent hardness	:	8.98	44.91	25.15	449.1
Temporary hardness	:	3.8	19.02	10.65	190.2
Alkalinity	:	3.8	19.02	10.65	190.2

(1 °f = 10 mg/l CaCO3/l 1 °g = 10 mg/l CaO)

Major ion composition

	mg/l	mmol/l	meq/l	meq%
Na+	265.0	11.527	11.527	24.117
K +	4.1	0.105	0.105	0.22
Ca++	121.6	3.034	6.068	12.695
Mg++	81.65	3.359	6.717	14.053
Cl-	432.0	12.185	12.185	25.493
SO4--	355.0	3.696	7.392	15.466
HCO3-	232.0	3.803	3.803	7.957

Ratios			Comparison to Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.489	0.903	0.319	0.194
Ca/SO4	0.343	0.821	0.152	0.364
Na/Cl	0.613	0.946	0.556	0.858

Dissolved Minerals:		mg/l	mmol/l
Halite (NaCl)	:	674.315	11.5268
Anhydrite (CaSO4)	:	503.363	3.696

Part-3 EXISTING WATER SUPPLY SISTEM AND SEWERAGE SYSTEM

3.1 Existing Water Use Condition

PRESENT CONDITION OF BEDOUIN'S COMMUNITY

CITY BELONGING : El Tur

Date : 96.9.30

Data Source : Manager of WRRI El Tur
Mr. Mohamed A. El-Hag

No	Item	Unit	Name of Bedouin's Community Surveyed: Wadi Village	El-Gedal	Ras-Raia	Mier
1	Population	Person	?	1,000	500	500
2	Well (Drinking)	No's	Non	Non	Non	2
	Depth	m	〃	〃	〃	0.15～5
	Intake Capacity	m^3/day	〃	〃	〃	?
	Qualities (good or not)	---	〃	〃	〃	Good
	EC (mmh/cm) or TDS	---	〃	〃	〃	TDS:640mg/l
	Including Agriculture	Yes/Not	〃	〃	〃	Yes
3	Well (Agriculture)	No's	35	20	Non	Non
	Depth	m			〃	〃
	Intake Capacity	m^3/day			〃	〃
	Qualities (good or not)	---	Good	Good	Good	〃
	EC (mmh/cm) or TDS	---	EC:0.9～4.0	EC:2.0～5.0	EC:4.0～8.0	〃
4	Other Water Source	---	from Muni	from Muni	from Muni	Non
	Using Water Capacity	m^3/month	?	?	?	〃
	Method of Conveyance	---	Pipeline	Pipeline	Pipeline	〃
	Water Tariff	LE/m^3	0.18 <30 m^3	0.18 <30 m^3	0.18 <30 m^3	〃
	(Lorry＝8 m3)	LE/Lorry	Non	Non	Non	〃
5	Present Problems					
	Water Quantity	---	Non	Non	Non	Non
	Actual Water Demand	m^3/day	〃	〃	〃	〃
	Water Qualities	---	〃	〃	〃	〃
	Others	---	〃	〃	〃	〃
6	Location (from City)	km	3	5	8	25
7	Water Distribution Method					
8	Remarks					

CITY BELONGING : Dahab

Date : 96.10.8

Data Source : Sael Village
Resident : Mr. Ahmed Slama

No	Item	Unit	Name of Bedouin's Community Surveyed: Seal
1	Population	Person	1,000
2	Well (Drinking)	No's	20
	Depth	m	15～20
	Intake Capacity	m^3/day	---
	Qualities (good or not)	---	Good
	EC (mmh/cm) or TDS	---	---
	Including Agriculture	Yes/Not	Not
3	Well (Agriculture)	No's	Non
	Depth	m	〃
	Intake Capacity	m^3/day	〃
	Qualities (good or not)	---	〃
	EC (mmh/cm) or TDS	---	〃
4	Other Water Source	---	Non
	Using Water Capacity	m^3/month	〃
	Method of Conveyance	---	〃
	Water Tariff	LE/m^3	〃
	(Lorry＝7 m3)	LE/Lorry	〃
5	Present Problems		
	Water Quantity	---	Water source for agriculture is shortage due to water level of wells is going down
	Actual Water Demand	m^3/day	Non
	Water Qualities	---	---
	Others	---	---
6	Location (from City)	km	65
7	Water Distribution Method		Pipeline
8	Remarks		Agriculture can not doing at present

PRESENT CONDITION OF BEDOUIN'S COMMUNITY

CITY BELONGING : Nuweiba

Date : 96.10.8

Data Source : El-Shikh Atiya Village
Son of Big Boss : Mr. Maesh Eneiz Salem

No	Item	Unit	Name of Bedouin's Community Surveyed: El-Shikh Atiya	Wasit	Nu-Magena
1	Population	Person	300	500～600	1,000～1,500
2	Well (Drinking)	No's	3	Non	Non
	Depth	m	8～13	〃	〃
	Intake Capacity	m^3/day	Max 30/well	〃	〃
	Qualities (good or not)	---	Good	〃	〃
	EC (mmh/cm) or TDS	---	---	〃	〃
	Including Agriculture	Yes/Not	Yes	〃	〃
3	Well (Agriculture)	No's	12	40	10
	Depth	m	7～10	7～14	3～13
	Intake Capacity	m^3/day	Max 30/well	Max 10/well	Max 10/well
	Qualities (good or not)	---	Good	Good	5:Good, 5:Not
	EC (mmh/cm) or TDS	---	TDS:1,500	TDS:2～4,000	TDS:2～8,000
4	Other Water Source	---	Non	Muni	Muni
	Using Water Capacity	m^3/month	〃	---	---
	Method of Conveyance	---	〃	Lorry	Lorry & Pipe
	Water Tariff	LE/m^3	〃	2.9	2.9/0.18
	(Lorry＝7 m3)	LE/Lorry	〃	20	20
5	Present Problems				
	Water Quantity	- -	well is far (L＝0.5km)	Water source of agriculture is shortage	Water source of agriculture is shortage
	Actual Water Demand	m^3/day	Non	Non	〃
	Water Qualities	---	〃	〃	
	Others	---	〃	〃	〃
6	Location (from City)	km	30	5	8
7	Water Distribution Method		Lorry		
8	Remarks				Village of Dolphin

CITY BELONGING : St.Catherine

Date : 96.9.27

Data Source : Chief of Wadi El-Raha
Mr. Mansour El Gebalia

No	Item	Unit	Name of Bedouin's Community Surveyed: Wadi El-Raha	El-Talfa Village	Wadi Feiran
1	Population	Person	50	400	2,000～2,500
2	Well (Drinking)	No's	1	25	20
	Depth	m	11	8～20	15～40
	Intake Capacity	m^3/day	---	?	?
	Qualities	---	Good	Good	Good
	EC (mmh/cm) or TDS	---			
	Including Agriculture	Yes/Not	Not	Yes	Yes
3	Well (Agriculture)	No's	Non	Non	Non
	Depth	m	〃	〃	〃
	Intake Capacity	m^3/day	〃	〃	〃
	Qualities	---	〃	〃	〃
	EC (mmh/cm) or TDS	---	---	---	---
4	Other Water Source	---	from Muni	〃	〃
	Using Water Capacity	m^3/month	16	〃	〃
	Method of Conveyance	---	Lorry	〃	〃
	Water Tariff	LE/m^3	1.4	〃	〃
	(Lorry＝8 m3)	LE/Lorry	11	〃	〃
5	Present Problems				
	Water Quantity	---	shortage	Non	Non
	Actual Water Demand	m^3/day	1.5	〃	〃
	Water Qualities	---	---	〃	〃
	Others	---	---	〃	〃
6	Location (from City)	km	Next to City	15	45
7	Water Distribution Method				
8	Remarks				

PRESENT CONDITION OF BEDOUIN'S COMMUNITY

Date : 96.10.7

CITY BELONGING : Wadi Feiran Village of Abu Rudeis

Data Source : Wadi Feiran Village of Municipality of Abu Rudeis
Chief of Council : Mr. Refat Mohamed Rashed

No	Item	Unit	General Information	Name of Bedouin's Community Surveyed: 1 El-Fourea	2 Kapair	3 Ayhbar	4 Sealsiph	5 EL-Hesowa
0-1	Area of Village	km x km	77 x 45					
0-2	Bedouin Community	No's	47	1	1	1	1	18
1	Population	Person	app. 6,000	136	395	260	52	1,904
2	Well (Drinking)	No's	3 (City)	1 (now off)	1	Non	Non	12 (50~60)
	Depth	m		---	50	"	"	18~40
	Intake Capacity	m^3/day	Max 3,000	---	100	"	"	---
	Qualities (good or not)	---	Good	---	Good	"	"	Good
	EC (mmh/cm) or TDS	---		---	---	"	"	---
	Including Agriculture	Yes/Not	Not	Not	Not	"	"	Yes
3	Well (Agriculture)	No's		4	5	Non	Non	Non
	Depth	m		18~20	10	"	"	"
	Intake Capacity	m^3/day		20	little	"	"	"
	Qualities (good or not)	---		Good	Good	"	"	"
	EC (mmh/cm) or TDS	---		---	---	"	"	"
4	Other Water Source	---		Kapair Comm	Non	Abu-Zagol Co	Kapair Comm	Many Comm
	Using Water Capacity	m^3/month		85	"	420	420	1,050
	Method of Conveyance	---		Lorry	"			Lorry
	Water Tariff	LE/m^3		Zero	"	0.7	0.18	1
	(Lorry=7 m3)	LE/Lorry		Zero	"	5		5
5	Present Problems							
	Water Quantity	---		---	---	---	---	well is very far (L=10km)
	Actual Water Demand	m^3/day		---	---	---	---	---
	Water Qualities	---		---	---	---	---	---
	Others	---		WSF is very old.	---	---	---	---
6	Location (from City)	km		Refer to Map (1: 250,000)				
7	Water Distribution Method			pipeline	pipeline	Lorry	pipeline	Lorry
8	Remarks			Capital of Wadi Feiran		Every household has a small water tank		Every household has a small water tank. Distribution pipeline is constructed in the near future

No	Item	Unit	Name of Bedouin's Community Surveyed: 1 Wadi El-Tar	2 Seal El-Yanes	3 Wadi Maketab	4 wadi Sahab	5 wadi Aslaf
0-1	Area of Village	km x km					
0-2	Bedouin Community	No's	4	6	2	12	1 (actual 4)
1	Population	Person	193	475	400	899	420
2	Well (Drinking)	No's	Non	12	Non	Non	1
	Depth	m	"	20~50	"	"	40
	Intake Capacity	m^3/day	"	125	"	"	75
	Qualities (good or not)	---	"	Good	"	"	Good
	EC (mmh/cm) or TDS	---	"	---	"	"	---
	Including Agriculture	Yes/Not	"	Yes	"	"	Yes
3	Well (Agriculture)	No's	Non	Non	Non	Non	Non
	Depth	m	"	"	"	"	"
	Intake Capacity	m^3/day	"	"	"	"	"
	Qualities (good or not)	---	"	"	"	"	"
	EC (mmh/cm) or TDS	---	"	"	"	"	"
4	Other Water Source	---	El-Fourea	Non	Deep Well	El-Fourea	Non
	Using Water Capacity	m^3/month	350	"	700	1120	"
	Method of Conveyance	---	Lorry	"			"
	Water Tariff	LE/m^3	0.7	"	0.7	0.7	"
	(Lorry=7 m3)	LE/Lorry	5	"	5		"
5	Present Problems						
	Water Quantity	---	well is very far (L=15km)	---	---	well is very far (L=7~27km)	---
	Actual Water Demand	m^3/day	---	---	---	---	---
	Water Qualities	---	---	---	---	---	---
	Others	---	---	---	---	---	---
6	Location (from City)	km	Refer to Map (1:250,000)				
7	Water Distribution Method		Lorry	pipeline	Lorry	Lorry	pipeline & Lorry
8	Remarks		Every household has a small water tank	As wells suffer damage by floods, prevent the floods control is necessary.	Transmission pipeline is under construction, it will be use from 1997. Deep well is belonging to the Ministry of PUBLIC WORKS.	Every household has a small water tank	Every household has a small water tank

PRESENT CONDITION OF BEDOUIN'S COMMUNITY

Date : 96.9.28

CITY BELONGING : Abu Zenima

Data Source : Municipality of Abu Zenima
Eng. Mohamed Hosny Mang

No	Item	Unit	Name of Bedouin's Community Surveyed: 1 El-Bada	2 El-Nasb	3 El-Rems-a	4 El-Habus	5 El-Swan
1	Population	Person	490	210	399	357	100
2	Well (Drinking)	No's	1	1	1	1	1
	Depth	m	15	15	10	25	10
	Intake Capacity	m^3/day	?	?	?	?	?
	Qualities (good or not)	---	Good	Good	Good	Good	Good
	EC (mmh/cm) or TDS	---	---	---	---	---	---
	Including Agriculture	Yes/Not	Yes	Not	Not	Not	Not
3	Well (Agriculture)	No's	Non	1	5	5	3
	Depth	m	"	10	10	10~15	10
	Intake Capacity	m^3/day	"	?	?	?	?
	Qualities (good or not)	---	"	Good	Good	Good	Good
	EC (mmh/cm) or TDS	---	---	---	---	---	---
4	Other Water Source	---	Non	Non	Non	Non	Non
	Using Water Capacity	m^3/month	"	"	"	"	"
	Method of Conveyance	---	"	"	"	"	"
	Water Tariff	LE/m^3	"	"	"	"	"
	(Lorry=8 m3)	LE/Lorry	"	"	"	"	"
5	Present Problems						
	Water Quantity	---	---	---	---	---	---
	Actual Water Demand	m^3/day	---	---	---	---	---
	Water Qualities	---	---	---	---	---	---
	Others	---	---	---	---	---	---
6	Location (from City)	km	Refer to Map (1: 250,000)				
7	Water Distribution Method						
8	Remarks						

No	Item	Unit	Name of Bedouin's Community Surveyed: 6 El-Sahou	7 El-Lehian	8 El-Hewesh	9 El-Samra	10 K-45
1	Population	Person	287	259		200	
2	Well (Drinking)	No's	Non	Non	Non	Non	Non
	Depth	m	"	"	"	"	"
	Intake Capacity	m^3/day	?	?	?	?	?
	Qualities (good or not)	---	Non	Non	Non	Non	Non
	EC (mmh/cm) or TDS	---	"	"	"	"	"
	Including Agriculture	Yes/Not	"	"	"	"	"
3	Well (Agriculture)	No's	Non	Non	Non	Non	Non
	Depth	m	"	"	"	"	"
	Intake Capacity	m^3/day	"	"	"	"	"
	Qualities (good or not)	---	"	"	"	"	"
	EC (mmh/cm) or TDS	---	"	"	"	"	"
4	Other Water Source	---	from Nasb/Hasb	Non	Non	from Muni	Non
	Using Water Capacity	m^3/month	?	"	"	?	"
	Method of Conveyance	---	Lorry	"	"	Lorry	"
	Water Tariff	LE/m^3	?	"	"	0.18 <30 m^3	"
	(Lorry=8 m3)	LE/Lorry	?	"	"	?	"
5	Present Problems						
	Water Quantity	---	---	---	---	---	---
	Actual Water Demand	m^3/day	---	---	---	---	---
	Water Qualities	---	---	---	---	---	---
	Others	---	---	---	---	---	---
6	Location (from City)	km	Refer to Map (1:250,000)				
7	Water Distribution Method						
8	Remarks						

PRESENT CONDITION OF BEDOUIN'S COMMUNITY Date : 96.9.29

CITY BELONGING : Ras Sudr

Data Source : Manager of Data Center, Municipality of Ras Sudr
Eng. Mohamed Hassan

No	Item	Unit	Name of Bedouin's Community Surveyed 1 Wadi Sudr	2 Abu-Swira	3 Abu-Geada	4 Madkhal A-G	5 El-Nahayat
1	Population (Year1986)	Person	441	307	177	137	288
2	Well (Drinking)	No's	Non	Non	10	4	8
	Depth	m	〃	〃	23~30	---	---
	Intake Capacity	m^3/day	〃	〃	?	0	0
	Qualities (good or not)	---	〃	〃	Good	No Good	No Good
	EC (mmh/cm) or TDS	---	〃	〃	?	---	---
	Including Agriculture	Yes/Not	〃	〃	Yes	Yes	Not
3	Well (Agriculture)	No's	150	500	U/G Reservoir	Non	U/G Reservoir
	Depth	m	10~18	10~18	---	〃	---
	Intake Capacity	m^3/day	?	?	?	〃	?
	Qualities (good or not)	---	Good	Good	Good	〃	Good
	EC (mmh/cm) or TDS	---	?	?	?	〃	?
4	Other Water Source	---	Main Pipeline	Main Pipeline	Non	Non	Non
	Using Water Capacity	m^3/day	500	[700]	〃	〃	〃
	Method of Conveyance	---	Pipeline	Pipeline	〃	〃	〃
	Water Tariff	LE/m^3	0.18 <30 m^3	0.18 <30 m^3	〃	〃	〃
	(Lorry=8 m3)	LE/Lorry	Non	Non	〃	〃	〃
5	Present Problems						
	Water Quantity	---	---	---	---	---	---
	Actual Water Demand	m^3/day	---	---	---	---	---
	Water Qualities	---	---	---	---	---	---
	Others	---	---	---	---	---	---
6	Location (from City)	km	Refer to Map (1: 250,000)				
7	Water Distribution Method						
8	Remarks			Using water capacity above mentioned is including in			

No	Item	Unit	Name of Bedouin's Community Surveyed 6 EL-Baga	7 Ain Sudr	8 El-Matha	9 El-Rena	10
1	Population (Year1986)	Person	128	421	685	123	
2	Well (Drinking)	No's	3	>10	1	Non	
	Depth	m	>40	>40	6	〃	
	Intake Capacity	m^3/day	?	?	?	〃	
	Qualities (good or not)	---	Good	Good	Good	〃	
	EC (mmh/cm) or TDS	---	?	?	Containing Lime	〃	
	Including Agriculture	Yes/Not	Not	Not	〃	〃	
3	Well (Agriculture)	No's	U/G Reservoir	Non	20	U/G Reservoir	
	Depth	m	——	〃	?	?	
	Intake Capacity	m^3/day	?	〃	?	?	
	Qualities (good or not)	---	Good	〃	Good	Good	
	EC (mmh/cm) or TDS	---	?	〃	?	?	
4	Other Water Source	---	from Nasb/Hasb	Non	Non	from Muni	
	Using Water Capacity	m^3/day	?	〃	〃	?	
	Method of Conveyance	---	Lorry	〃	〃	Lorry	
	Water Tariff	LE/m^3	?	〃	〃	0.18 <30 m^3	
	(Lorry=8 m3)	LE/Lorry	?	〃	〃	?	
5	Present Problems						
	Water Quantity	---	---	---	---	---	
	Actual Water Demand	m^3/day	---	---	---	---	
	Water Qualities	---	---	---	---	---	
	Others	---	---	---	---	---	
6	Location (from City)	km	Refer to Map (1:250,000)				
7	Water Distribution Method						
8	Remarks						

3.2 Existing Water Supply and Sewerage System

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep.29,1996 & Feb.5,1998

Interviewer : Mr. Mostafa, Miyakoshi, Yabe

City Name : Ras Sudr Data Source : Municipality of Ras Sudr

No	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A : 4.2 km^2 C.A : 16.8 km^2	
1.2	Served Population			
	Year 1996	capita	Total : 6,501	Census Date in 1996
		〃	Urban : 1,419	〃
		〃	Rural : 5,082	〃
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb,98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	〃	2,500	〃
	lower-class (approximately)	〃	1,500	〃
1.4	Average Water Tariff of a House	LE/M	5 ~ 8	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 1,900	
2.2	Commercial	〃	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	〃	Supplier: Muni ,Cap:	〃
2.4	Industries	〃	Supplier: Muni ,Cap:	〃
2.5	Agriculture	〃	Supplier: Non ,Cap: Non	
2.6	Others	〃	Supplier: Non ,Cap: Non	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	Non	
	(for potable water)		〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)		〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.3	River Nile	m^3/d	1,900	
	Water Qualities (good or not)		Good (to be conveyed after treated in Suez City)	
3.4	Sea Water	m^3/d	Non	
3.5	From the Other City			
	by pipeline	m^3/d	〃	
	by lorries	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.6	Total Using Capacity	m^3/d	1,900	
4	Main Water Supply Facilities			
4.1	Intake Facility		Non	
	Distance from Served Area	km	〃	
4.2	Aqueduct Facility			
	Pipe Material of Main		Ductile Cast Iron	
4.3	Water Treatment System		Non	
	Methods of System		〃	
	Capacity of Production	m^3/d	〃	
	kind of Disinfectant		〃	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,000m^3 x 1 (Elevated Tank H=35m),500m^3 x 2	
	Distribution System (pipe/lorry)		pipeline	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		〃	
	Well Structure (Typical)		〃	
	Reservoirs		〃	
	Treatment Plant		〃	
	Others		〃	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	-30:0.15,30~50:0.25,50~:1.00	
5.2	Commercial	〃	1	
5.3	Hotel (for Tourists)	〃	6	
5.4	Industry	〃	1	
5.5	Agriculture	〃	Non	
5.6	Others	〃	〃	
5.7	Unit Water Production Cost	〃	Non (taking from main pipeline of MOD)	
5.8	Cost Recovery Ratio	%	70 (Muni & Police are free charge)	
5.9	Annual Budget & Revenues		20,000 LE/Y. O/M & personnel costs is provided by South Sinai Gov. Assign of Muni is O/M of pipe net work	
5.10	Production & Invoicing Capacity	m^3/day	Pro: 1,900 Inv: 1,330	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Main Equip : MOD 100% Pipeline : Muni 100%	
6.2	O & M (at present)	〃		

No	Items	Unit	Description	Remarks
7	Division of Responsibility			
7.1	Planning		MOD	
7.2	Construction		MOD	
7.3	Management		MOD (Assign of Muni is O/M of pipe net work)	
7.4	Operation		〃	
7.5	Maintenance		MOD (Assign of Muni is O/M of pipe net work)	
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person		
	Planning	〃	Non (to be conducted by MOD)	
	Construction	〃	〃	
	Management	〃	Eng. 1	
	Operation	〃	Eng. 1, Tech. 3, Worker. 2	
	Maintenance	〃	including above	with 3 cars
	Laboratory	〃	Non	
8	Present Problems			
8.1	Management		Non	
	Total Capacity of Supply Water		〃	
	Water Quality		〃	
	Water Loss		〃	
	Others		〃	
8.2	Facilities			
	Intake Water Source		Non	
	Treatment Facilities		〃	
	Others		〃	
8.3	Organization		〃	
9	Future's Plan		Depends on NPDS	
9.1	Management		〃	
9.2	Facilities			
9.3	Organization		Non	
9.4	Water Demand		〃	
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's	Non	
10.2	Treatment System		Oxidation Ponds	under construction
10.3	Wastewater Rate (Inflow)	m^3/d		(commencement
10.4	Wastewater Quality (Inflow)			of 1998)
10.5	Treated Wastewater Quality		Non	〃
10.6	Discharge Point		Evaporation & Infiltration	〃
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	〃

[Interview List]	Belonging Organization
Mr. Tarek Attia	Mayor of Municipality of Abu Zenima
Mr. Fawy Abd El Rhaman	No2 of Municipality of Abu Zenima
Mr. Ali Feshad Ali Beduey	No3 of Municipality of Abu Zenima
Mr. Esa Mobarek	Secretary of Council Abu Zenima
Eng. Mohamed Hosny Mang	Chief of Engineering Dep, Abu-Zenima

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep 28,1996 & Feb 7,1998

Interviewer : Mr. Mostafa, Miyakoshi, Yabe

City Name : Abu-Zenima

Data Source : Municipality of Abu-Zenima

No	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A 1.9 km^2 C.A . 21.1 km^2	
1.2	Served Population			
	Year 1996	capita	Total 5,670	Census Data in 1996
		"	Urban : 2,645	"
		"	Rural : 2,925	"
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb.98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	"	2,500	"
	lower-class (approximately)	"	1,500	"
1.4	Average Water Tariff of a House	LE/M	2 ~ 4	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 1,600	
2.2	Commercial	"	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	"	Supplier: Muni ,Cap:	"
2.4	Industries	"	Supplier: Muni ,Cap:	"
2.5	Agriculture	"	Supplier: Non ,Cap: Non	
2.6	Others	"	Supplier: Non ,Cap: Non	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	Non	
	(for potable water)		"	
	Intake Capacity	m^3/d	"	
	Water Qualities (good or not)		"	
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)		"	
	Intake Capacity	m^3/d	"	
	Water Qualities (good or not)		"	
3.3	River Nile	m^3/d	1,600	
	Water Qualities (good or not)		Good (to be conveyed after treated in Suez City)	
3.4	Sea Water	m^3/d	Non	
3.5	From the Other City			
	by pipeline	m^3/d	"	
	by lorries	m^3/d	"	
	Water Qualities (good or not)		"	
3.6	Total Using Capacity	m^3/d	1,600	
4	Main Water Supply Facilities			
4.1	Intake Facility		Non	
	Distance from Served Area	km	"	
4.2	Aqueduct Facility			
	Pipe Material of Main		Ductile Cast Iron	
4.3	Water Treatment System		Non	
	Methods of System		"	
	Capacity of Production	m^3/d	"	
	kind of Disinfectant		"	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,000 Elevated Tank	H=35 m
	Distribution System (pipe/lorry)		pipeline (branched main:Asbestos, other:Steel, UPVC)	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		"	
	Well Structure (Typical)		"	
	Reservoirs		"	
	Treatment Plant		"	
	Others		"	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	~30 : 0.18, 30~50 : 0.25 ,50~ : 1.00	
5.2	Commercial	"	1	same as by lorry
5.3	Hotel (for Tourists)	"	6	"
5.4	Industry	"	3	
5.5	Agriculture	"	Non	
5.6	Others	"	"	
5.7	Unit Water Production Cost	"	Non (branch out from main pipeline of MOD)	
5.8	Cost Recovery Ratio	%	100 (except the Muni & Police Station)	
5.9	Annual Budget & Revenues		Assign of Muni is O/M of pipe net work	
5.10	Production & Invoicing Capacity	m^3/day	Pro: 1,600 Inv: 1,600	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Source: MOD ,Ratio: 100 %	
	1980~1986			
	1986~1995			
6.2	O & M (at present)	"	Source: MOD ,Ratio: %	
	1980~1986			
	1986~1995			

No	Items	Unit	Description	Remarks
			Main Supply MOD 0%	
			Pipeline Muni 20%	
7	Division of Responsibility			
7.1	Planning			"
7.2	Construction			"
7.3	Management		"	"
7.4	Operation		"	"
7.5	Maintenance		Main : MOD, Pipeline : Muni	"
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person		
	Planning	"	Non (to be conducted by MOD)	
	Construction	"	"	
	Management	"	Total 22, (Eng.1, Tech. 4, Worker. 15, Driver. 2)	
	Operation	"	Including above	
	Maintenance	"	Including above	
	Laboratory	"	Ministry of Health	
8	Present Problems			
8.1	Management			
	Total Capacity of Supply Water		Non	
	Water Quality		"	
	Water Loss		"	
	Others		Water meters are necessity in the supply net work	
8.2	Facilities			
	Intake Water Source		Non	
	Treatment Facilities		"	
	Others		can not use three reservoirs at present for fault in them	
8.3	Organization		accessories of pipeline are necessary, such as air valves	
9	Future's Plan		Depends on NPDS	
9.1	Management		"	
9.2	Facilities		Asbest pipe will be change to UPVC in few years	
9.3	Organization		Depends on NPDS	
9.4	Water Demand		"	
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's	Non	
10.2	Treatment System		Oxidation Ponds	under construction
10.3	Wastewater Rate (Inflow)	m^3/d		(commencement
10.4	Wastewater Quality (Inflow)			of 1998)
10.5	Treated Wastewater Quality		Non	"
10.6	Discharge Point		Evaporation & Infiltration	"
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	"

[Interview List]	Belonging Organization	
Mr. Essan Naeie	Mayor of Municipality of Ras Sudr	1996
Mr. Refery El Ashry	Manager of Data Center of Ras Sudr	
Eng. Mohamed Hassan	Chief Engineer of Water Dep, Ras Sudr	
Mr. Sayed Ahmed Zagawa	Mayor of Municipality of Ras Sudr	1998
Mr. Refery El Ashry	Manager of Data Center of Ras Sudr	
Mr. Abdalla Abbas Aly	General Secretary of Municipality of Ras Sudr	
Eng. Hassan Al Tomame	Engineer of Water Dep, Ras Sudr	
Mr. Sayed Abd El Aal	Technician of Water Dep, Ras Sudr	

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep 28,1998

Interviewer : Mr. Mostafa, Miyakoshi

City Name : Abu Rudeis Data Source : Municipality of Abu-Rudeis

No	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A : 6.9 km^2 C.A : 10.2 km^2	
1.2	Served Population			
	Year 1996	capita	Total : 7,438	Census Data in 1996
		〃	Urban : 4,152	〃
		〃	Rural : 3,286	〃
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb,98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	〃	2,500	〃
	lower-class (approximately)	〃	1,500	〃
1.4	Average Water Tariff of a House	LE/M	5 ~ 8	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 500	
2.2	Commercial	〃	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	〃	Supplier: Non ,Cap: Non	
2.4	Industries	〃	Supplier: Muni ,Cap: 7 ~ 800	〃
2.5	Agriculture	〃	Supplier: Non ,Cap: Non	
2.6	Others	〃	Supplier: Non ,Cap: Non	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	Non	3 (for Beduin)
	(for potable water)	〃	〃	
	Intake Capacity	m^3/d	〃	100 (Max 3,000)
	Water Qualities (good or not)	〃	〃	Good
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)	〃	〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)	〃	〃	
3.3	River Nile	m^3/d	1,300	
	Water Qualities (good or not)		Good (to be conveyed after treated in Suez City)	
3.4	Sea Water	m^3/d	Non	
3.5	From the Other City			
	by pipeline	m^3/d	〃	
	by lorries	m^3/d	〃	
	Water Qualities (good or not)	〃	〃	
3.6	Total Using Capacity	m^3/d	1,300	
4	Main Water Supply Facilities			
4.1	Intake Facility		Non	for City area
	Distance from Served Area	km	〃	
4.2	Aqueduct Facility			
	Pipe Material of Main		Ductile Cast Iron	
4.3	Water Treatment System		Non	
	Methods of System		〃	
	Capacity of Production	m^3/d	〃	
	kind of Disinfectant		〃	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,000 Elevated Tank	H=35 m
	Distribution System (pipe/lorry)		pipeline	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		〃	
	Well Structure (Typical)		〃	
	Reservoirs		〃	
	Treatment Plant		〃	
	Others		〃	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	-30:0.18,30-50:0.25,50-:1.00	
5.2	Commercial	〃	6.5	
5.3	Hotel (for Tourists)	〃	Non	
5.4	Industry	〃	6.5	
5.5	Agriculture	〃	Non	
5.6	Others	〃	〃	
5.7	Unit Water Production Cost	〃	Non (taking from main pipeline of MOD)	
5.8	Cost Recovery Ratio	%	100	
5.9	Annual Budget & Revenues		Assign of Muni is O/M of pipe net work	
5.10	Production & Invoicing Capacity	m^3/day	Pro: 1,300 Inv: 1,300	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Source: MOD ,Ratio: 100 %	
	1980 ~ 1986			
	1986 ~ 1995			
6.2	O & M (at present)	〃	Source: MOD ,Ratio: %	
	1980 ~ 1986			
	1986 ~ 1995			

No	Items	Unit	Description	Remarks
7	Division of Responsibility			
7.1	Planning		MOD	
7.2	Construction		MOD	
7.3	Management		MOD	
7.4	Operation		MOD (Assign of Muni is O/M of pipe net work)	
7.5	Maintenance		MOD (Assign of Muni is O/M of pipe net work)	
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person		
	Planning	〃	Non (to be conducted by MOD)	
	Construction	〃	〃	
	Management	〃	Eng. 1, Tech. 2, Worker. 4	
	Operation	〃	Consignment to Care Service & Regwa Ltd.,	
	Maintenance	〃	Non (to be conducted by MOD)	
	Laboratory	〃	〃	
8	Present Problems			
8.1	Management			
	Total Capacity of Supply Water		Shortage the water in summer season	
	Water Quality		Non	
	Water Loss		〃	
	Others		〃	
8.2	Facilities			
	Intake Water Source		Non	
	Treatment Facilities		〃	
	Others		can not lift to elevated tank directory by pressure of main pipe	
8.3	Organization		〃	
9	Future's Plan		Depends on NPDS	
9.1	Management		〃	
9.2	Facilities		〃	
9.3	Organization		〃	
9.4	Water Demand		〃	
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's	Non	
10.2	Treatment System		Oxidation Ponds	under construction
10.3	Wastewater Rate (Inflow)	m^3/d		(commencement
10.4	Wastewater Quality (Inflow)			of 1998)
10.5	Treated Westewater Quality		Non	〃
10.6	Discharge Point		Evaporation & Infiltration	〃
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	〃

[Interview List]	Belonging Organization
Mr. Kamel Abo Salem	No2 of Municipality of Abu-Rudeis City
Mr. Mohamed El Syed	No3 of Municipality of Abu-Rudeis City
Eng. Aly Abd Alla Mohamed	Chief of Engineering Dep of Abu-Rudeis City

[Note]

Although JICA Study Team has had intervied for renewal the existing data to the Municipality of Abu-Rudeis in Feb 7, 1998, it could not obtain cooperation from the city side.

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep.25,1996 & Feb.10,1998

Interviewer : Mr. Mostafa, Mr. Ashraf, Miyakoshi, Sugimoto, Yabe,

City Name : St. Catherine Data Source : Municipality of St. Catherine

No	Items	Unit	Description	Remarks
1	Basic Condition	km^2	S.A.:3.1km^2 C.A.: 3.4km^2	
1.1	Served Area			
1.2	Served Population			
	Year 1996	capita	Total : 4,219	Census Data in 1996
		〃	Urban : 745	〃
		〃	Rural : 3,465	〃
			Exchang Rate : LE 3.38 /US$ (as of Feb.98)	
1.3	Annual Income of a Household			
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	〃	2,500	〃
	lower-class (approximately)	〃	1,500	〃
1.4	Average Water Tariff of a Hous	LE/M	10 + 6.5 (sewerage)	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 500	
2.2	Commercial	〃	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	〃	Supplier: Muni ,Cap:	〃
2.4	Industries	〃	Supplier: Non ,Cap: Non	
2.5	Agriculture	〃	Supplier: Non ,Cap: Non	
2.6	Others	〃	Supplier: Non ,Cap: Non	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	3	
	(for potable water)			
	Intake Capacity	m^3/d	500	
	Water Qualities (good or not)		Good	
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)		〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.3	River Nile	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.4	Sea Water	m^3/d	〃	
3.5	From the Other City		〃	
	by pipeline	m^3/d	〃	
	by lorries	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.6	Total Using Capacity	m^3/d	500	
4	Main Water Supply Facilities			
4.1	Intake Facility		Depth 50 m	
	Distance from Served Area	xm	No1:1.5, No2:6.5, No3:16	
4.2	Aqueduct Facilty			
	Pipe Material of Main		Steel & PVC (Dia 100 mm)	
4.3	Water Treatment System			1 set
	Methods of System		Non	
	Capacity of Production	m^3/d	〃	
	kind of Disinfectant		〃	
4.4	Distribution Facilty			
	Capacity of Reservoir	m^3	33	for No1 Well
	Distribution System (pipe/lorry)		No1:Well:Pipe, No2,3Wells:Lorry	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		〃	
	Well Structure (Typical)		〃	
	Reservoirs		〃	
	Treatment Plant		〃	
	Others		〃	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	4 LE/M/House, Rural Area : LE 10/lorry (8 m3)	
5.2	Commercial	〃	4 LE/M/House	
5.3	Hotel (for Tourists)	〃	6	
5.4	Industry	〃	Non	
5.5	Agriculture	〃	〃	
5.6	Others	〃	〃	
5.7	Unit Water Production Cost	〃	No1:2 ~ 3 (by pipeline) , No2,3:6 ~ 8(by lorry)	include labor,power
5.8	Cost Recovery Ratio	%	100	
5.9	Annual Budget & Revenues	LE/Y	10000 + 19200 (As Personnel Expence of 8 persons)	
5.10	Production & Invoicing Capacity	m^3/day	Pro: 500 Inv: 500	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Source: Muni Ratio: 100 %	
	1980 ~ 1986			
	1986 ~ 1995			
6.2	O & M (at present)	〃	Source: Muni ,Ratio: 80 %	
	1980 ~ 1986			
	1986 ~ 1995			

No	Items	Unit	Description	Remarks
7	Division of Responsibility			
7.1	Planning		Muni (St. Catherine)	
7.2	Construction		〃	
7.3	Management		〃	
7.4	Operation		〃	
7.5	Maintenance		〃	
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person	Eng ,Tech ,Worker	
	Planning	〃	Total 3, (Eng.0, Tech. 3,)	
	Construction	〃	including above	
	Management	〃	Worker, 3 (as a water charge collector)	
	Operation	〃	Worker, 3 (for wells), Driver,5	lorry , 5 cars
	Maintenance	〃	---	
	Laboratory	〃	Non	
8	Present Problems			
8.1	Management		shortage the forces	wide the jurisdiction area
	Total Capacity of Supply Water		necessity more than 3 times at present	
	Water Quality		Non	
	Water Loss		〃	
	Others		〃	
8.2	Facilities		〃	
	Intake Water Source		contamination of wells with increase of wastewater	
	Treatment Facilities		Non	
	Others		〃	
8.3	Organization		〃	
9	Future's Plan			
9.1	Management		Non	
9.2	Facilities		Development of new wells & pipe network	under construction
9.3	Organization		Non	
9.4	Water Demand		be adapted against for new life style	
10	Sewerage System		Under construction at present	complete till March 99
10.1	Relay Pumping Station (P/S)	No's	Non	
10.2	Treatment System		Activated Sludge	present : Infiltration
10.3	Wastewater Rate (Inflow)	m^3/d	2,000	
10.4	Wastewater Quality (Inflow)			
10.5	Treated Wastewater Quality		Will be used as water source of an agriculture.	
10.6	Discharge Point			
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	
	[Interview List]		Belonging Organization	
	Mr. Mohamed Abd El Bast Ahmed		Second Man of City Council	
	Mr. Hesham Ahmed Kamel		Manager of Public Relations	

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep 24,1996 & Feb 11,1998

Interviewer : Mr. Mostafa, Miyakoshi, Sugimoto, Yabe

City Name : Nuweiba

Data Source : Municipality of Nuweiba

No	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A.:8.5km^2 C.A.: 29.5km^2	
1.2	Served Population			
	Year 1996	capita	Total : 5,657	Census Data in 1996
		"	Urban : 2,405	"
		"	Rural : 3,252	"
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb,98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	"	2,500	"
	lower-class (approximately)	"	1,500	"
1.4	Average Water Tariff of a House	LE/M	15 (Potable) ~ 10 (Others)	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 400 (Potable), 2,700 (brackish)	
2.2	Commercial	"	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	"	Supplier: Private ,Cap: more than 600	Hilton & Helnan hotels
2.4	Industries	"	Supplier: Non ,Cap: Non	
2.5	Agriculture	"	Supplier: Muni ,Cap:	Brackish only
2.6	Others	"	Supplier: MOD ,Cap: 4 ~ 5	for Gov.Police
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	5	
	(for ~~potable~~ brackish water)		(3 : for City, 2 : for Port)	
	Intake Capacity	m^3/d	2,700	
	Water Qualities (good or not)		Not (TDS: 2,500~7,900)	
3.2	Existing Intake Well (2/2)	No's	Non	
	(for egriculture & Others)		"	
	Intake Capacity	m^3/d	"	
	Water Qualities (good or not)		"	
3.3	River Nile	m^3/d	"	
	Water Qualities (good or not)		"	
3.4	Sea Water	m^3/d	400 (Muni) ~ 5 (MOD)	
3.5	From the Other City		Non	
	by pipeline	m^3/d	"	
	by lorries	m^3/d	"	
	Water Qualities (good or not)		"	
3.6	Total Using Capacity	m^3/d	400 ~ 5 = 2,700	
4	Main Water Supply Facilities			
4.1	Intake Facility		Depth 30 ~ 60 m	
	Distance from Served Area	km	6	
4.2	Aqueduct Facility			
	Pipe Material of Main		Steel (from well up to mix-box), Asbestos & PVC	
4.3	Water Treatment System			1 set
	Methods of System		Evaporation (Muni), E-Dialysis (MOD)	
	Capacity of Production	m^3/d	400 (Design Capacity 2,000) ~ 5	
	kind of Disinfectant		NaHCl : 1,400 g/day	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,000 (potable) + 1,000 & 500 (brackish)	
	Distribution System (pipe/lorry)		Lorry (potable), Pipeline (brackish)	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		"	
	Well Structure (Typical)		"	
	Reservoirs		"	
	Treatment Plant		"	
	Others		"	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	1	10 LE/M/Home (brackish)
5.2	Commercial	"	6	
5.3	Hotel (for Tourists)	"	6	
5.4	Industry	"	Non	
5.5	Agriculture	"	"	
5.6	Others	"	"	
5.7	Unit Water Production Cost	"	22 (including labor,power)	potable
5.8	Cost Recovery Ratio	%	100 (potable), < 60 (brackish)	
5.9	Annual Budget & Revenues	LE/Y	2,000,000	as O/M of WTP
5.10	Production & Invoicing Capacity	m^3/day	Pro: 400 ~ 2,700, Inv: 400 ~ 2,200	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Source: S.Sinai Gov & MOD, Ratio: 100%	
6.2	O & M (at present)	"	Source: S.Sinai Gov & MOD, Ratio: 70%	
7	Division of Responsibility			
7.1	Planning		Muni (Nuweiba)	
7.2	Construction		"	
7.3	Management		"	
7.4	Operation		"	(Regwa & Others)
7.5	Maintenance		Muni (Nuweiba)	(Regwa & Others)
7.6	Laboratory		"	
7.7	No's of Staffs (Total)	person		
	Planning	"	Total 15, (Eng. 2, Tech. 2, Worker. 1, Driver 10)	
	Construction	"	including above	
	Management	"	"	
	Operation	"	Regwa & Temseh Co. Ltd (2 firms) on Contract	
	Maintenance	"	Total 26	Well : 10 (Regwa Co)
	Laboratory	"	Including Planning Dep	Desal : 16 (Temseh Co)
8	Present Problems			
8.1	Management		limitation on water supply time	4 hour/day
	Total Capacity of Supply Water		shortage potable water	
	Water Quality		health breaks due to lack of ingredient minerals	
	Water Loss	%	20 (brackish)	
	Others		Non	
8.2	Facilities		"	
	Intake Water Source		shortage the production water	under construction
	Treatment Facilities		shortage the production water	
	Others		supply methods want to change to pipeline	completion as of Feb. 98
8.3	Organization		water sector want to establish in Muni	
9	Future's Plan			
9.1	Management		Non	
9.2	Facilities		supply methods want to change to pipeline	
9.3	Organization		water sector want to establish in Muni	
9.4	Water Demand		depends on NPDS	
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's		
10.2	Treatment System		Oxidation Ponds	8 Plants
10.3	Wastewater Rate (Inflow)	m^3/d	1,800	
10.4	Wastewater Quality (Inflow)			
10.5	Treated Wastewater Quality		Non	
10.6	Discharge Point		Evaporation & Infiltration	reuseing for plantation (about 50 m^3/day)
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	

[Interview List]	Belonging Organization
Mr. Mohsaed El Tibany	City Council of Nuweiba City
Mr. Aiman Aod El Latif	Geologist of Nuweiba City
Eng. Regale Arafa Kholi	Manager of water & wastewater, Municipality of Nuweiba,

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Date Surveyed : Sep.23,1996 & Feb.11,1998

Interviewer : Mr. Mostafa, Miyakoshi, Sugimoto, Yabe,

City Name : Dahab — Data Source : Municipality of Dahab & Nuweiba

No.	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A. 10.5km^2 C.A. 15.4km^2	
1.2	Served Population			
	Year 1996	capita	Total : 3,758	Census Data in 1996
		〃	Urban : 1,077	〃
		〃	Rural : 2,681	〃
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb.98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	〃	2,500	〃
	lower-class (aproximately)	〃	1,500	〃
1.4	Average Water Tariff of a House	LE/M	10	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 900 (portable) + 500 (brackish)	Including above
2.2	Commercial	〃	Supplier: Muni ,Cap:	
2.3	Hotel (for Tourists)	〃	Supplier: Private ,Cap: 2 ~ 300	
2.4	Industries	〃	Supplier: Non ,Cap: Non	
2.5	Agriculture	〃	Supplier: Non ,Cap: Non	
2.6	Others	〃	Supplier: Non ,Cap: Non	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	4	
	(for potable water)		(washing use only)	
	Intake Capacity	m^3/d	500	
	Water Qualities (good or not)		Not	Brackish
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)		〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.3	River Nile	m^3/d	Non	
	Water Qualities (good or not)		〃	
3.4	Sea Water	m^3/d	900 (Max. 2,000)	500 m3/d /sell x 4sells
3.5	From the Other City		Non	
	by pipeline	m^3/d	〃	
	by lorries	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.6	Total Using Capacity	m^3/d	1,400	
4	Main Water Supply Facilities			
4.1	Intake Facility			
	Distance from Served Area	km	5	washing use only
4.2	Aqueduct Facility			
	Pipe Material of Main		PVC & Steel	
4.3	Water Treatment System		Storage Reservoir : 3,000 m^3	1 set
	Methods of System		RO system	
	Capacity of Production	m^3/d	2,000	500 m3/d /sell x 4sells
	kind of Disinfectent		CL gas	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,250	
	Distribution System (pipe/lorry)		Pipeline for urban area & Lorry for rural area	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		〃	
	Well Structure (Typical)		〃	
	Reservoirs		〃	
	Treatment Plant		〃	
	Others		〃	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	1	
5.2	Commercial	〃	6	
5.3	Hotel (for Tourists)	〃	6	
5.4	Industry	〃	Non	
5.5	Agriculture	〃	〃	
5.6	Others	〃	〃	
5.7	Unit Water Production Cost	〃	7 ~ 8 (including labor,power)	
5.8	Cost Recovery Ratio	%	100	
5.9	Annual Budget & Revenues	LE/Y	110,000 (O/M of Pipe net work)	50,000 for Desali
5.10	Production & Invoicing Capacity	m^3/day	Pro tav:	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Muni & MOD Muni : Pipe net work & Sewerage MOD : WTP & Reservoirs and so on	
6.2	O & M (at present)	〃	Muni & MOD Muni : Pipe net work & Sewerage MOD : WTP & Reservoirs and so on	

No.	Items	Unit	Description	Remarks
7	Division of Responsibility		(WTP) (Pipe Net work)	
7.1	Planning		MOD/S.Sinai Muni	
7.2	Construction		MOD/S.Sinai Muni	
7.3	Management		MOD/S.Sinai Muni	
7.4	Operation		MOD/S.Sinai Muni	
7.5	Maintenance		MOD/S.Sinai Muni	〃
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person	(for Pipe net work)	(WTP)
	Planning	〃	Total 10. (Eng.1, Tech. 3, Worker.0, Driver 6)	
	Construction	〃	including above	
	Management	〃	〃	
	Operation	〃	Care Service Ltd on Contract	Regwa on Contract
	Maintenance	〃	Total 30 (Desali:8, Care service:17, Regwa 5)	
	Laboratory	〃	Non	
8	Present Problems			
8.1	Management		Non	
	Total Capacity of Supply Water		〃	
	Water Quality		〃	
	Water Loss	%	10	for washing use
	Others		WTP is under MOD control, others are Muni.	
8.2	Facilities		〃	
	Intake Water Source		〃	
	Treatment Facilities		〃	
	Others		〃	
8.3	Organization		〃	
9	Future's Plan			
9.1	Management		wish control all of WSF in Muni	
9.2	Facilities		Draw water from wells will be stopped after completion the new Desali plant.	
9.3	Organization		All potable water is supplied from the WTP.	
9.4	Water Demand			
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's	5	
10.2	Treatment System		Oxidation Ponds	3 pond/plant x 2
10.3	Wastewater Rate (Inflow)	m^3/d	1,120	
10.4	Wastewater Quality (Inflow)			
10.5	Treated Wastewater Quality		Non	
10.6	Discharge Point		Evaporation & Infiltration	reuseing for plantation
10.7	Circumstance of Discharge Point		Bad, Good, Excellent,	
	[Interview List]		Belonging Organization	
	Mr. Mostafa Ahmad Abd El Rahman		City council of Dahab City	
	Mr. Frag Omran		〃	
	Eng. Saleh		Care Service LTD., Dahab	
	Eng. Ragaie Arafa Kholi		Manager of water & westewater, Municipanty of Nuweiba.	

South Sinai Groundwater Resources Study

Data Sheet of Existing Condition of Water Supply System in the Study Area

Data Surveyed : Sep 22 & Oct 9, 1996 & Feb 12,1998

Interviewer : Mr. Mostafa, Miyakoshi, Sugimoto, Yano

City Name : Sharm El Sheikh

Data Source : Care Service LTD., Sharm El Sheikh

No.	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A.:1.3km^2 C.A.: 1.8km^2	
1.2	Served Population			
	Year 1996	capita	Total : 7,197	Census Data in 1996
		〃	Urban : 4,799	〃
		〃	Rural : 2,398	〃
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb,98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	〃	2,500	〃
	lower-class (approximately)	〃	1,500	〃
1.4	Average Water Tariff of a House	LE/M	10	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 100 (Actual)	970 (Design cap).
2.2	Commercial	〃	Supplier: CITY ,Cap:	Including above
2.3	Hotel (for Tourists)	〃	Supplier: CITY ,Cap: 10,000	2 private firm & others
2.4	Industries	〃	Supplier: CITY ,Cap:	
2.5	Agriculture	〃	Supplier: ,Cap: 300	
2.6	Others	〃	Supplier: ,Cap:	
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2)	No's	Non	Refer to Well
	(for potable water)		〃	List & Map
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	Refer to A-Data
3.2	Existing Intake Well (2/2)	No's	Non	
	(for agriculture & Others)		〃	
	Intake Capacity	m^3/d	〃	
	Water Qualities (good or not)		〃	
3.3	River Nile	m^3/d	Non	under construction
	Water Qualities (good or not)		〃	
3.4	Sea Water	m^3/d	10,100	
3.5	From the Other City		El Tur City	
	by pipeline	m^3/d	1,000 (Max:1,800)	for irrigation :300
	by lorries	m^3/d	1,500	
	Water Qualities (good or not)		Good	
3.6	Total Using Capacity	m^3/d	12,000	
4	Main Water Supply Facilities			
4.1	Intake Facility		Non	
	Distance from Served Area	km	〃	
4.2	Aqueduct Facility		Non	
	Pipe Material of Main		〃	
4.3	Water Treatment System			
	Methods of System		Mechanical Vapor Compacted	for public use
			Reverse Osmosis	for Tourism use
	Capacity of Production	m^3/d	6,000	
	kind of Disinfectant		Non	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	5,000	1 sets
	Distribution System (pipe/lorry)		pipeline	seperated by consumer
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		〃	
	Well Structure (Typical)		〃	
	Reservoirs		〃	
	Treatment Plant		〃	
	Others		〃	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	~30:0.18,30~50:0.25,50~:1.00	
5.2	Commercial	〃	1	
5.3	Hotel (for Tourists)	〃	6	
5.4	Industry	〃	1	
5.5	Agriculture	〃	---	
5.6	Others	〃	---	
5.7	Unit Water Production Cost	〃	Desal : 18, Pipeline : 3~4, Lorry : 12~20	
5.8	Cost Recovery Ratio	%	---	
5.9	Annual Budget & Revenues		---	
5.10	Production & Invoicing Capacity	m^3/day	Pro: 12,000 Inv:	
6	Subsidy (Financial Source and Assistance Ratio)			
6.1	Construction (at present)	%	Source: ,Ratio: %	
	1980 ~ 1986		Source: ,Ratio: %	
	1986 ~ 1995		Source: ,Ratio: %	
6.2	O & M (at present)	〃	Source: ,Ratio: %	
	1980 ~ 1986		Source: ,Ratio: %	
	1986 ~ 1995		Source: ,Ratio: %	

No.	Items	Unit	Description	Remarks
7	Division of Responsibility			
7.1	Planning		MOD & Muni	
7.2	Construction		MOD & Muni	
7.3	Management		Muni	
7.4	Operation		Desal : MOD, Pipeline : Muni	(Care Service Ltd..)
7.5	Maintenance		Desal : MOD, Pipeline : Muni	(Care Service Ltd..)
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)	person		
	Planning	〃	Eng. : 1 ,Tech : 5	
	Construction	〃	including above	
	Management	〃	including above	
	Operation	〃	Consignment to Care Service Ltd..	Care Service Staffs
	Maintenance	〃	〃	Total 90 persons
	Laboratory	〃	Non	
8	Present Problems			
8.1	Management		Non	
	Total Capacity of Supply Water		There is limit to water supply, two hour per day	
	Water Quality		in summer season. Winter season is enough.	
	Water Loss		Non	
	Others		〃	
8.2	Facilities		〃	
	Intake Water Source		〃	
	Treatment Facilities		〃	
	Others		〃	
8.3	Organization		〃	
9	Future's Plan		New Desalination Plant (under construction)	complete till March 98
9.1	Management		Non	(4,000 m3/d)
9.2	Facilities		〃	
9.3	Organization		〃	
9.4	Water Demand		expand the tourists	
10	Sewerage System		New System being under construction	complete till March 98
10.1	Relay Pumping Station (P/S)	No's	6	
10.2	Treatment System		Oxidation Ponds	
10.3	Wastewater Rate (Inflow)	m^3/d	3,500~5,000	
10.4	Wastewater Quality (Inflow)			
10.5	Treated Wastewater Quality		Non	
10.6	Discharge Point		Evaporation & Infiltration	reuseing for plantation
10.7	Circumstance of Discharge Point		Bad, Good, Excellent.	
	[Interview List]		Belonging Organization	
	Mr. Zakaria Shalbe		City Council of Sharm El Sheikh City	
	Eng. Mohamed Abd EL Aziz		Care Service LTD., Sharm El Sheikh	
	Eng. Ahmed Abu El Hfez		〃	
	Eng. Lotfy M. Kaereldin		〃	

South Sinai Groundwater Resources Study
Data Sheet of Existing Condition of Water Supply and Sewerage System in the Study Area

Date Surveyed : Sep 21,1996 & Feb 9, 1998

Interviewer : Mr. Mostafa, Mr. Fady, Miyakoshi, Sugimoto, Yabe

City Name : El Tur — Data Source : South Sinai Gov, Municipality of El Tur

No.	Items	Unit	Description	Remarks
1	Basic Condition			
1.1	Served Area	km^2	S.A.:13km^2 C.A.: 21km^2	
1.2	Served Population			
	Year 1996	capita	Total : 14,155	Census Date in 1996
		"	Urban : 12,072	"
		"	Rural : 2,083	"
1.3	Annual Income of a Household		Exchang Rate : LE 3.38 /US$ (as of Feb,98)	
	high-class (approximately)	LE/Y	4,000	Public Service
	middle-class (approximately)	"	2,500	"
	lower-class (approximately)	"	1,500	"
1.4	Average Water Tariff of a House	LE/M	10	middle-class
2	Existing Water Use Conditions (Supplier and Supply Capacity)			
2.1	Residents	m^3/d	Supplier: Muni ,Cap: 6,000	
2.2	Commercial	"	Supplier: Muni ,Cap:	Including above
2.3	Hotel (for Tourists)	"	Supplier: Muni ,Cap:	"
2.4	Industries	"	Supplier: Muni ,Cap:	"
2.5	Agriculture	"	Supplier: ,Cap:	
2.6	Others	"	Supplier: ,Cap:	Including above
3	Water Source (for Potable use & Others)			
3.1	Existing Intake Well (1/2) (for potable water)	No's	8 (No.12,15,20,21,23,26,28,29) 2 (for Sharm EL Sheikh, No.T1,T2)	Refer to Well List & Map
	Intake Capacity	m^3/d	8,000	
	Water Qualities (good or not)		Good	Refer to A-Data
3.2	Existing Intake Well (2/2) (for agriculture & Others)	No's	Non	
	Intake Capacity	m^3/d	"	
	Water Qualities (good or not)		"	
3.3	River Nile	m^3/d	"	
	Water Qualities (good or not)		"	
3.4	Sea Water	m^3/d	"	
3.5	From the Other City			
	by pipeline	m^3/d	"	
	by lorries	m^3/d	"	
	Water Qualities (good or not)		"	
3.6	Total Using Capacity	m^3/d	8,000	
4	Main Water Supply Facilities			
4.1	Intake Facility		Depth 30~50 m	
	Distance from Served Area	km	10	
4.2	Aqueduct Facility			
	Pipe Material of Main		Steel Pipe	
4.3	Water Treatment System		Receiving Reservoir 2,500 m^3	1 set
	Methods of System		Disinfectoin Only	
	Capacity of Production	m^3/d	7,000	
	kind of Disinfectant		CL gas	
4.4	Distribution Facility			
	Capacity of Reservoir	m^3	1,200 + 600	2 sets
	Distribution System (pipe/lorry)		pipeline	
4.5	Major Drawings of W.S.Facilities			
	Layout		Non	
	Flow Diagram		"	
	Well Structure (Typical)		"	
	Reservoirs		"	
	Treatment Plant		"	
	Others		"	
5	Water Tariff & Production Cost			
5.1	Residents	LE/m^3	~30:0.18,30~50:0.25,50~:1.00	
5.2	Commercial	"	1	
5.3	Hotel (for Tourists)	"	6	
5.4	Industry	"	1	
5.5	Agriculture	"	---	
5.6	Others	"	---	
5.7	Unit Water Production Cost	"	0.5 (including labor,power)	
5.8	Cost Recovery Ratio	%	70	
5.9	Annual Budget & Revenues			
5.10	Production & Invoicing Capacity	m^3/day	Pro: 8,000 Inv: more than 5,000	
6	Subsidy (Financial Source and Assistence Ratio)			
6.1	Construction (at present)	%	Source: Muni ,Ratio: 100 %	
	1980~1985		Source: Muni ,Ratio: 20 %	& MOD: 80 %
	1986~1995		Source: Muni ,Ratio: 80 %	& MOD: 20 %
6.2	O & M (at present)	"	Source: Muni ,Ratio: 80 %	& MOD: 20 %
	1980~1985		Source: Muni ,Ratio: 20 %	& MOD: 80 %
	1986~1995		Source: Muni ,Ratio: 80 %	& MOD: 20 %

No.	Items	Unit	Description	Remarks
7	Division of Responsibility			
7.1	Planning		Muni (El Tur)	
7.2	Construction		Muni (El Tur)	
7.3	Management		Muni (El Tur)	
7.4	Operation		Muni (El Tur)	(Regwa Ltd.)
7.5	Maintenance		Muni (El Tur)	"
7.6	Laboratory		Ministry of Health	
7.7	No's of Staffs (Total)			
	Planning	"	Eng : 1 ,Tech : 3 ,Worker :11	
	Construction	"	including above	
	Management	"	including above	
	Operation	"	Consignment to Care Service & Regwa Ltd..	
	Maintenance	"	"	
	Laboratory	"	Non	
8	Present Problems			
8.1	Management		Non	
	Total Capacity of Supply Water		"	
	Water Quality		"	
	Water Loss		"	
	Others		"	
8.2	Facilities		"	
	Intake Water Source		"	
	Treatment Facilities		"	
	Others		"	
8.3	Organization		"	
9	Future's Plan		Depends on National Organization	
9.1	Management		for Drinking Water & Sewerage	
9.2	Facilities		(Public Corporation of Egypt)	
9.3	Organization			
9.4	Water Demand			
10	Sewerage System			
10.1	Relay Pumping Station (P/S)	No's	4 P/S & 1 Main	
10.2	Treatment System		Oxidation Ponds + Activated Sludge (for reuse)	
10.3	Wastewater Rate (Inflow)	m^3/d	3,000	1,000 (for reuse)
10.4	Wastewater Quality (Inflow)			
10.5	Treated Wastewater Quality		Non	
10.6	Discherge Point		Evaporation & Infiltration	reuseing for plantation
10.7	Circumstance of Discherge Point		Bad, Good, Excellent,	

(Interview List)	Belonging Organization	
Mr. WALLA KHAYAB	Data Center, South Sinai Government	
Mr. EBRAHEM EL TABAKH	Water Supply Dep. Municipality of El Tur	
Mr. MAHAMED ABDEL RAZIG	REGWA (Private Firm)	
Mr. Mohamed, A. El-Hag	El Tur, WRRI	
Mr. FADY, M. FARID	El Tur, WRRI	
Mr. ASHRAF MEMR	St. Katherine, WRRI	*Toraʾsan
Mr. Mohamoed Abd El Rahim	South Sinai development Authority	

Part-4 MICRO FOSSIL ANALYSIS

Microfaunal Analysis:

Depth:	**(2-17) m**
Lithology:	Marly limestone
Fauna:	Morozovella velascoensis
	Morozovella acuta
	Morozovella subbotina
	Morozovella aragoensis
	Acarinina soldadoensis
	Globigerina linaperta
	Pseudo hastigerina wikoxensis
	Morozovella acqua
	Planorotalites pseudomenadii
	Gavelinella rubiginosa
	Bulimina asper
	Eponoides lotus
	Globigerina velascoensis
Age:	Latest Paleocene
Formation:	Esna Formation

Depth:	**(22-35)m**
Lithology:	Dark green shale
Fauna:	Heterohelix striata
	Bolivinoides dracodroco
	Gavelinella danica
	Gyroidina girardana
	Rosita plicata
	Rugoglobigerina rugosa
	Archaeglobigerina oretacea
	Globotruncanita stuarti
	Hedbergella holdelensis
	Globotruncana arca
	Ganssarina gansseri
	Stensioina excolata
	Globotruncana aegyptiaca
	Globotruncana falsostuarti
Age:	Late to Middle Maastrichtian

Formation:	Sudr Formation
Depth:	**(124-211) m**
Lithology	Brownish clay and argilaceous limestone
Fauna:	Heterohelix globulosa
	Rosita fronicata
	Globorotalites conicus
	Globotruncana esnahensis
	Globotruncana linneiana
	Globotruncana arca
	Globotruncana bulloides
	Globigerinelloides ultramicra
	Globotruncanita stuartiformis
Age:	Earliest Maastrichtian to Lata Campanian
Formation	Sudr Formation
Depth:	**(215-296) m**
Lithology:	Argilaceous limestone with phosphatic limestone
Fauna:	Bolivia decurrens
	Gavelinella stephensoni
	Globoturncanita elevata
	Anomalinoides umboniferus
	Gyroidinoides quadratus
	Globotruncana ventricosa
	Globotruncana bulloides
	Hedbergella holmdelensis
	Globotruncana lapperenti
	Globorotalites coniurs
Age:	Middle to Early Campanian
Formation:	Duwi Formation
Depth:	**(300-381) m**
Lithology	Chalky limestone and sandy limestone, clay
Fauna:	Hedbergella delvioensis
	Hedbergella flandrini
	Whiteinella baltica
	Heterohelix reussi

	Dicarinella concavata
	Dicarinella asymmetrica
	Marginetruncana coronata
	Marginetruncana marginata
	Rosita fornicata
	Discorbis turonicus
Age:	Coniacian – Santonian
Formation:	Matulla Formation
Depth:	**(385 - 486)m**
Lithology:	White limestone and oolitic limestone
Fauna:	Discorbis turonicus marginata
	Discorbis turonicus
	Discorbis minuta
	Discorbis simplex
	Hedbergella plani spira
	Hedbergella simplex
	Whiteinella baltice
	Whiteinella archaeocretacea
	Helerahelix reussi
	Margino trun sigali
	Marginotruncana pseudo linneiana
Age:	(Late – Middle) Turonian
Formation:	Wata Formation
Depth:	**(490-571) m**
Lithology:	Calareous clay and limestone
Fauna:	Whiteinella baltica
	Heterohelix reussi
	Hedbergella planispira
	Whiteinella archeocretacea
	Discorbis turonicus
	Nazzazatinella aegyptiaca
	Ostracada species
	Cythereis rawashensis
	Brachy cy there angulata

	Ovacytheridea reniformis
	Cytherella tuboruifera
Age:	Earliest Turonian
Formation:	Abu Qa'ada Formation
Depth:	**(575 – 661) m**
Lithology:	Gluconite
Fauna:	Calcoreous alage
	Nezzazata simplex
	Nezzazata gyra
	Hedbergella planispira
	Cytherella posteramgulata
	Thomasinella aegyptia
	Thomasinella fragmentania
	Biconcava bentori
	Globi gerinellaides bentonensis
	Guembeltria cenomani
Age:	(Middle to Late) Cenomanian
Formation:	Raha Formation
Depth:	**(665 – 861) m**
Lithology:	Dolomitic limestone and shale
Fauna:	Favusella washitensis
	Praehlotruncana derioensis
	Hedbergella simplex
	Haplophragmoides rugosa
	Hemichclammina evoluta
	Biconava of bentori
	Dorthia exycona
	Thonasinella aegyptia
	Daxia cenomana
	Ostracoda species
	Xestoleberis dereremensis
	Veeniacythereis tezzienesis
	Ammebarculites subcretacea
	Rotalipora brozeni
	Discorbis beadnelli

Age:	(Earliest Cenomanian)
Formation:	Raha Formation
Depth:	**(865 – 1126) m**
Lithology:	Sandstone with some shale
Fauna:	Osracoda sp
	Gluconites
	Fladellamina sp
	Arenaceous formis
Age:	(Early Cretaceous)
Formation:	Malha Formation
Depth:	**(1130 – 1250)**
Lithology:	Coal, black shale and sandstone
Age:	May be (Jurassic)
Formation:	Amir Formation