PART III : SUMMARY OF THE RESULT OF SUBCONTRACT SURVEY

Appendix 1

Industrial Wastewater Quality Survey

1.1 Technical Specifications

1.1.1 General Specification

(1) Objective

Objective of the water quality survey of industrial wastewater is to analyze water quality of industrial wastewater and to investigate outline of factory and its manufacturing activities by questionnaire.

(2) Scope of Work

The survey consist water quality analysis and data collection of the outline of the factory by questionnaire. Target area of this survey is the entire area of Syria (it is mainly considered as 7 Governorates in Damascus Rural Area, Dar'a, Tartous, Lattakia, Al-Rakka, Dier-ez-zor, and Al-Hasake). The details of the survey are described below.

1.1.2 Water Sampling and Water Quality Analysis

The work of water sampling and water quality analysis includes all the works of sampling and analysis, including survey planning, sampling, on-site measurement of necessary items, initial preservation of the samples and their transportation to the laboratory for the analyses.

(1) Sampling

A plan for water sampling points is shown in the following table. The exact locations (factories) shall be determined through discussions with the JICA Study Team.

Table 1 Number of Samples

Objective factory	Nos. of factory (Nos. of survey)	Nos. of analytical items	Nos. of samples for analysis
Olive oil factory and Sugar factory	10 factories (1 time)	15 items	10 samples
Food factory	10 factories (1 time)	14 items	10 samples
Tannery, Textile/ Clothing, Oil refinery, Fertilizer factory, Cement factory and Others	35 factories (1 time)	27 items	35 samples
Paper factory	5 factories (1 time)	28 items	5 samples
Total	60 Factories	-	60 samples

(2) Analysis Items

A plan for the items of water quality analysis is shown in Table 2. The methods for sampling and analysis to be employed shall conform to the internationally accepted procedure (e.g. WHO, American / European / Japanese and Syria standards for water quality analysis).

1.1.3 Questionnaire Survey

The questionnaire survey is conducted in order to acquire the information on a factory that water analysis investigation is conducted.

(1) Number of Object for Questionnaire Survey

Objects of the questionnaire survey are the same as the water sampling and water quality analysis. Total number of object for questionnaire survey is 60 factories.

(2) Contents of Questionnaire

Contents of questionnaire are listed below. Tentative questionnaire sheet is shown in Table 3.

(3) Modification of Questionnaire Sheet

Before implementation of questionnaire survey, contractor shall rehearse questionnaire survey using a tentative questionnaire sheet which is prepared by the Study Team. Based on the results of the questionnaire survey, the questionnaire sheet shall be modified through discussions with the Study Team.

1.1.4 Equipment, Materials and Labor

The Contractor shall provide all the equipment, vehicle, personnel and materials necessary for the Work.

(1) Reporting

The Contractor shall submit an actual implementation plan not later than 1 week after the signing of the Agreement. The Contractor shall submit progress reports according to the JICA Study Team request.

The Contractor shall prepare a final report which includes all the results of analyses, analytical methods used and its detected limit. Photographs of the fieldwork shall be taken and submitted together with the report. The contractor shall submit the final reports in English and Arabic (each 2 hard copies and 2 CD-R) to the Study Team by the end of February.

(2) Work Schedule

The period of the survey, including reporting, shall be around 2 months after the contract has been signed.

Table 4. Work Schedule (tentative)

Work Items	December	January	February	March
Meeting				
Preparation of implementation plan				
Rehearsal of questionnaire survey				
Water sampling & Questionnaire				
Water quality analysis				
Reporting				

(3) Communication system

The contractor shall establish the communication system with the JICA Study Team in the time of

ordinary and an emergency.

(4) Special Note

This Specification of Survey Work has been prepared based on general knowledge on water quality survey of Industrial wastewater and on specific conditions in Syria which the Study Team has learned by the time of the preparation. Since it is anticipated that actual conditions in Syria may differ from the Study Team's understanding, sampling schedule, sampling time and others specified in this Specification except number of sample and analytical items may be modified through consultation with JICA Study Team. Especially, it is necessary to fully notice the following items.

(ア) Sampling schedule for factories which are seasonal operation such as Olive factory, Sugar factory and etc.

(イ) Sampling time for factories which have a variation of water quality and a discontinuous operation.

(5) Price Schedule

1) Breakdown of Agreement price

Item	Price (US$)
1. Water quality analysis	21,975
2. Water sampling	3,600
3. Reporting	3,500
Sub total	29,075
Tax (10%)	2,907
Total (US$)	31,982 31,980

2) Costs to be Included in the Agreement Price

- Costs for mobilization, demobilization, per diem allowance for the survey team and others required for execution of the survey are included in each sub-item.
- Any taxes and charges are included in the agreement price.

Table 2 Water Quality Analysis Item and Number of Sampling Point (Number of Factory)

	Water quality item		Standard	Unit	Water quality analysis items and number of sampling points in type of industry									
					(1) Olive oil factory	(2) Tannery	(3) Food factory	(4) Textile / Clothing	(5) Fertilizer factory	(6) Oil refinery	(7) Sugar factory	(8) Paper factory	(9) Cement factory	(10) Others
1	Temperature	T	35	℃	○	○	○	○	○	○	○	○	○	○
2	Hydrogen No.	pH	6.5-9.5	-	○	○	○	○	○	○	○	○	○	○
3	Precipitable Soil Materials	SS	10	mg/L	○	○	○	○	○	○	○	○	○	○
4	Total of Suspended Particles	TSS	500	mg/L	○	○	○	○	○	○	○	○	○	○
5	Sulfide	S	2	mg/L	○	○	○	○	○	○	○	○	○	○
6	Sulfate	SO_4	1,000	mg/L	○	○	○	○	○	○	○	○	○	○
7	Ammonia/Ammonium	NH_4-N,NH_3-N	100	mg/L	○	○	○	○	○	○	○	○	○	○
8	Phosphate	PO_4	20	mg/L	○	○	○	○	○	○	○	○	○	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○	○	○	○	○	○	○	○	○	○
10	Metallic oil and grease	-	10	mg/L	○	○	○	○	○	○	○	○	○	○
11	Boron	B	1.0	mg/L		○		○	○	○		○	○	○
12	Cadmium	Cd	0.1	mg/L		○		○	○	○		○	○	○
13	Cr^{6+}	Cr	0.1	mg/L		○		○	○	○		○	○	○
14	Calcic Chromium	Cr	2.0	mg/L		○		○	○	○		○	○	○
15	Copper	Cu	0.1	mg/L		○		○	○	○		○	○	○
16	Lead	Pb	0.1	mg/L		○		○	○	○		○	○	○
17	Mercury	Hg	0.01	mg/L		○		○	○	○		○	○	○
18	Nickel	Ni	2.0	mg/L		○		○	○	○		○	○	○
19	Selenium	Se	1.0	mg/L		○		○	○	○		○	○	○
20	Zinc	Zn	4.0	mg/L		○		○	○	○		○	○	○
21	Cyanide	CN	0.5	mg/L		○		○	○	○		○	○	○
22	Arsenic	As	0.1	mg/L		○		○	○	○		○	○	○
23	BOD	BOD	800	mg/L	○	○	○	○	○	○	○	○	○	○
24	COD	COD	1,600	mg/L	○	○	○	○	○	○	○	○	○	○
25	TDS	TDS	2,000	mg/L	○	○	○	○	○	○	○	○	○	○
26	Chloride	Cl	600	mg/L	○	○	○	○	○	○	○	○	○	○
27	Fluoride	F	8.0	mg/L		○		○	○	○		○	○	○
28	Pesticides	-	0.005	mg/L	○						○			
29	Algesiac Organic Compounds	AOX	0.1	mg/L								○		
*	Barium	Ba	3.0	mg/L		*		*	*	*		*	*	*
*	Silver	Ag	1.0	mg/L		*		*	*	*		*	*	*
*	Phenol Components	-	2.0	mg/L		*		*	*	*		*	*	*
*	Detergents	ABS	5	mg/L	*	*	*	*	*	*	*	*	*	*
	Number of objective factory				5	5	10	5	5	5	5	5	5	10
					Total number of objective factory = 60									

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network.
○ : Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

1.2 Summary of the Results of Survey

1.2.1 Olive pressing Factory Type

Company Name	Location	Sample
Ramadan	Tartous	1
Gazi	Tartous	1
Bsmakah	Tartous	1
Ain Kbira	Tartous	1
Almaruf	Tartous	1
Alnukhbeh	Tartous	1
Abou Hamzeh	Darra	2

1.2.2 Canning factory (Vegetable/fruit):

Company Name	Location	Sample
Al Reef Company	Rural Damascus	1
Factory for Tomato	Darra	1

Selected analysis water quality item for Olive Oil:

Water quality item			Unit	Olive oil factory
1	Temperature	T	℃	○
2	Hydrogen No.	pH	-	○
3	Precipitable Soil Materials	SS	mg/L	○
4	Total of Suspended Particles	TSS	mg/L	○
5	Sulfide	S	mg/L	○
6	Sulfate	SO_4	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	mg/L	○
8	Phospate	PO_4	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	mg/L	○
10	Metallic oil and grease	-	mg/L	○
11	Boron	B	mg/L	
12	Cadmium	Cd	mg/L	
13	Cr^{6+}	Cr	mg/L	
14	Calcic Chromium	Cr	mg/L	
15	Copper	Cu	mg/L	
16	Lead	Pb	mg/L	
17	Mercury	Hg	mg/L	
18	Nickel	Ni	mg/L	
19	Selenium	Se	mg/L	
20	Zinc	Zn	mg/L	
21	Cyanide	CN	mg/L	
22	Arsenic	As	mg/L	
23	BOD	BOD	mg/L	○

24	COD	COD	mg/L	○
25	TDS	TDS	mg/L	○
26	Chloride	Cl	mg/L	○
27	Fluoride	F	mg/L	
28	Pesticides	-	mg/L	○
29	Algonac Organic Compounds	AOX	mg/L	
*	Barium	Ba	mg/L	
*	Silver	Ag	mg/L	
*	Phenol Compounds	-	mg/L	
*	Detergents	ABS	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

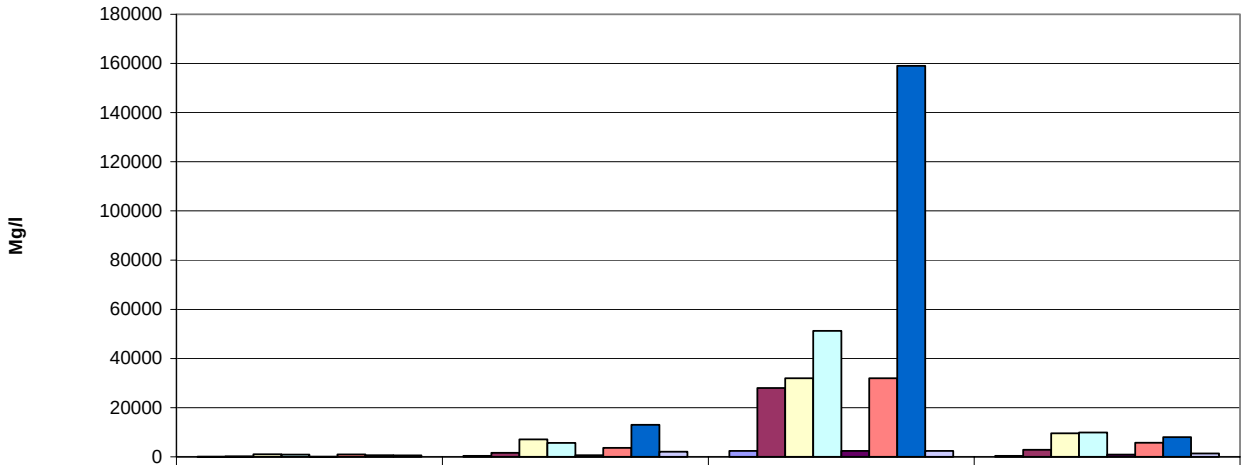
Factory Type: Oil Pressing

Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	PO4	N-NH4	SO4	S	TSS	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	200	2	500	10	6.5-9.5	35	
<1.5		33	384	2400	475											3.1	22	40	2100	3	1780	147	6.33	19	Ramadan
<1.5		300	1630	28000	2830											8	200	120	608	9	1500	430	4.69	16	Gazi
<1.5		1050	7080	32000	9615											0	1300	1750	2800	15	3615	1070	4.65	17	Barakah
<1.5		960	1720	31200	9880											0.6	2600	2250	750	10	9070	2600	4.41	18	Ain Khira
<1.5		68	780	2400	920											0	22	140	330	4.7	2100	818	6.77	11	Almaraf
<1.5		1000	1620	32000	2740											0.0	350	600	2500	10	1830	1270	4.66	12	Alsakhbeh
<1.5		790	13000	159000	8000											0.8	1400	1300	630	18	2150	1870	5.17	10.8	Abou Hamzeh1
<1.5		600	2100	2400	1400											0.1	23	200	220	6	1080	120	5.19	10.5	Abou Hamzeh2

Factory Type: Canning factory

Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	PO4	N-NH4	SO4	S	TSS	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	200	2	500	10	6.5-9.5	35	
<1.5		30	840	1700	20											5	1.5	3	156	0.17	128	30	5.9	11	Al Reef Company
		120	470	85	30											3	0.1	0.19	45	0	6	0	7.81	16.4	Bassam for Tomato

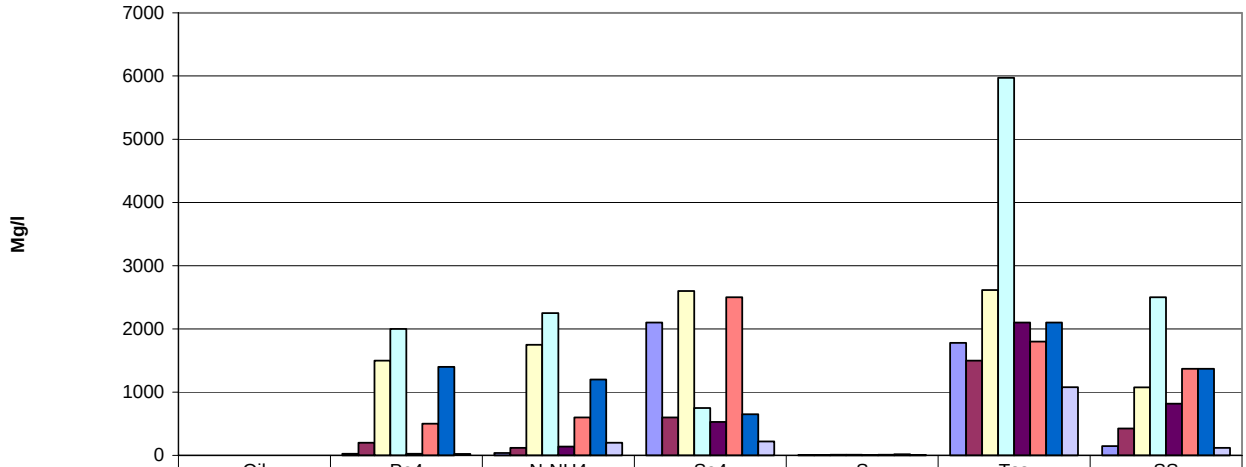
OIL PRESSING



	Cl	TDS	COD	BOD
Ramadan	50	384	2400	419
Gazi	200	1630	28000	2830
Bsmakah	1050	7080	32000	9610
Ain Kbira	900	5720	51200	9880
Almaruf	60	705	2400	920
Alnukbeh	1000	3650	32000	5740
Abou Hazeh1	700	13000	159000	8000
Abou Hazeh2	600	2100	2400	1400

Parameters

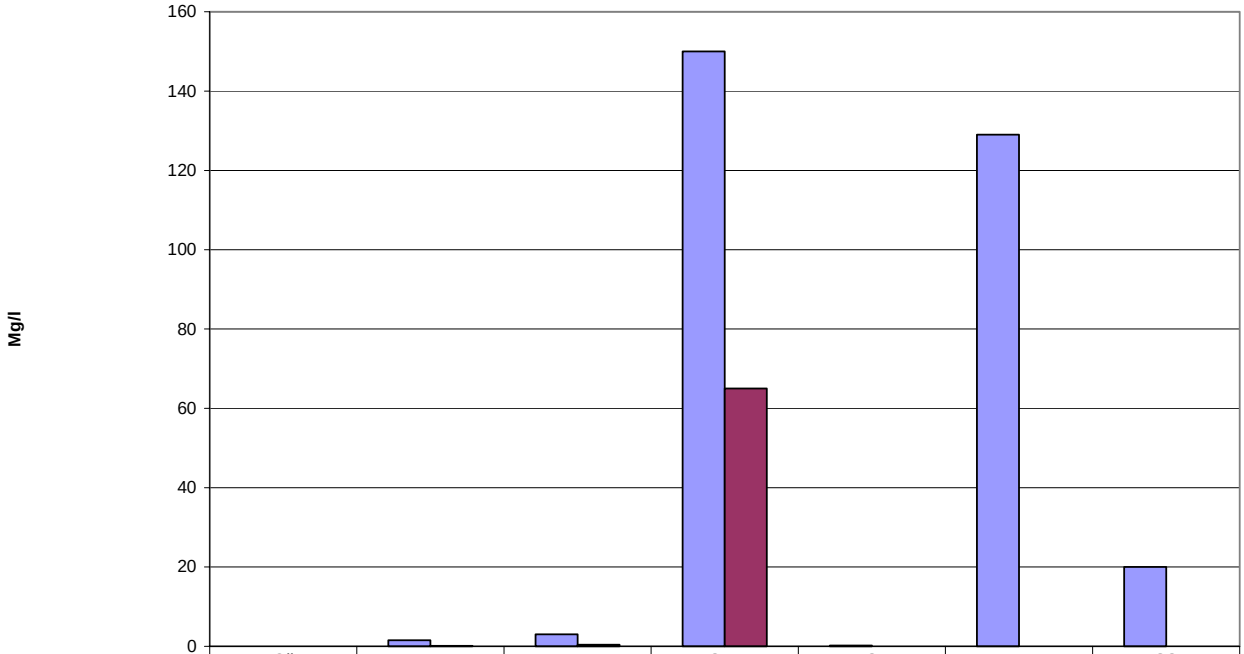
OIL PRESSING



	Oil	Po4	N-NH4	So4	S	Tss	SS
Ramadan	0.1	25	40	2100	5	1780	147
Gazi	0	200	120	600	8	1500	426
Bsmakah	0	1500	1750	2600	10	2615	1076
Ain Kbira	0.8	2000	2250	750	10	5970	2500
Almaruf	0	25	140	530	4.5	2100	819
Alnukbeh	0.6	500	600	2500	10	1800	1370
Abou Hazeh1	0.8	1400	1200	650	18	2100	1370
Abou Hazeh2	0.1	23	200	220	6	1080	120

Parameters

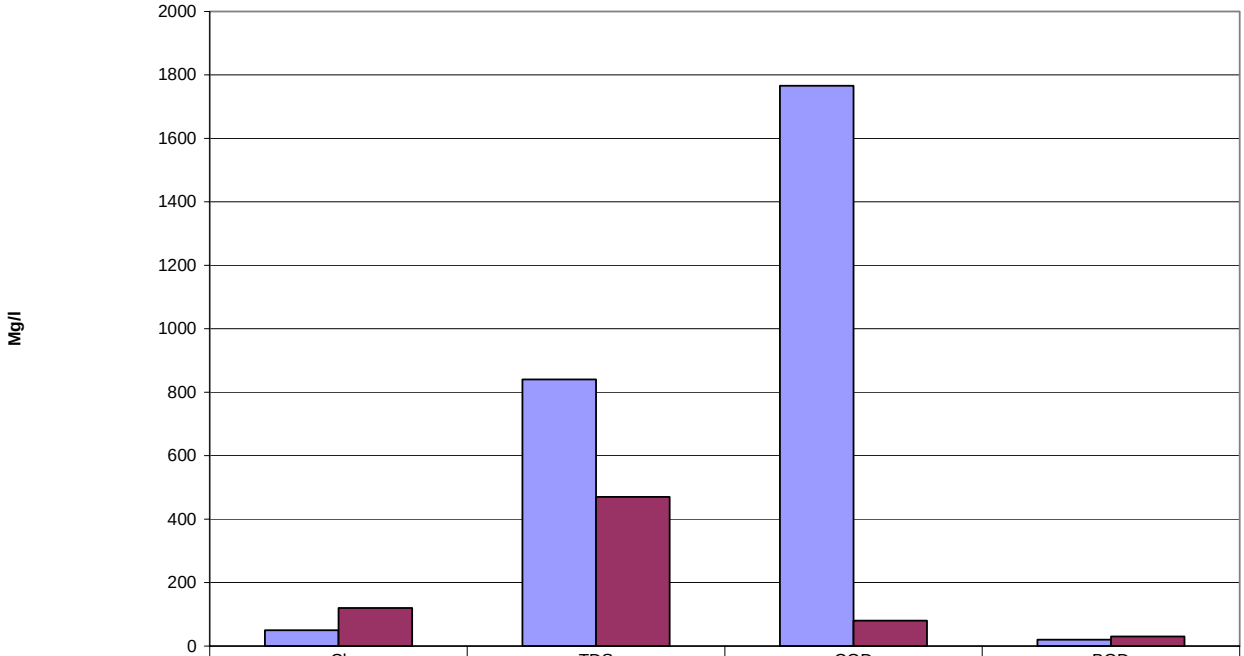
Canning Factories



	Oil	Po4	N-NH4	So4	S	Tss	SS
Al Reef Company	0	1.5	3	150	0.17	129	20
Bassam for Tomato	0	0.1	0.39	65	0	0	0

Parameters

Canning Factories



	Cl	TDS	COD	BOD
Al Reef Company	50	840	1766	20
Bassam for Tomato	120	470	80	30

Parameters

1.2.3 Paper Factory

Company Name	Location	Sample
Abdlatif badinkji factory	Aleppo	1
DEZ Paper Factory	Deir EZ Zor	1
Alnuameh Company for Carton	Darra	1

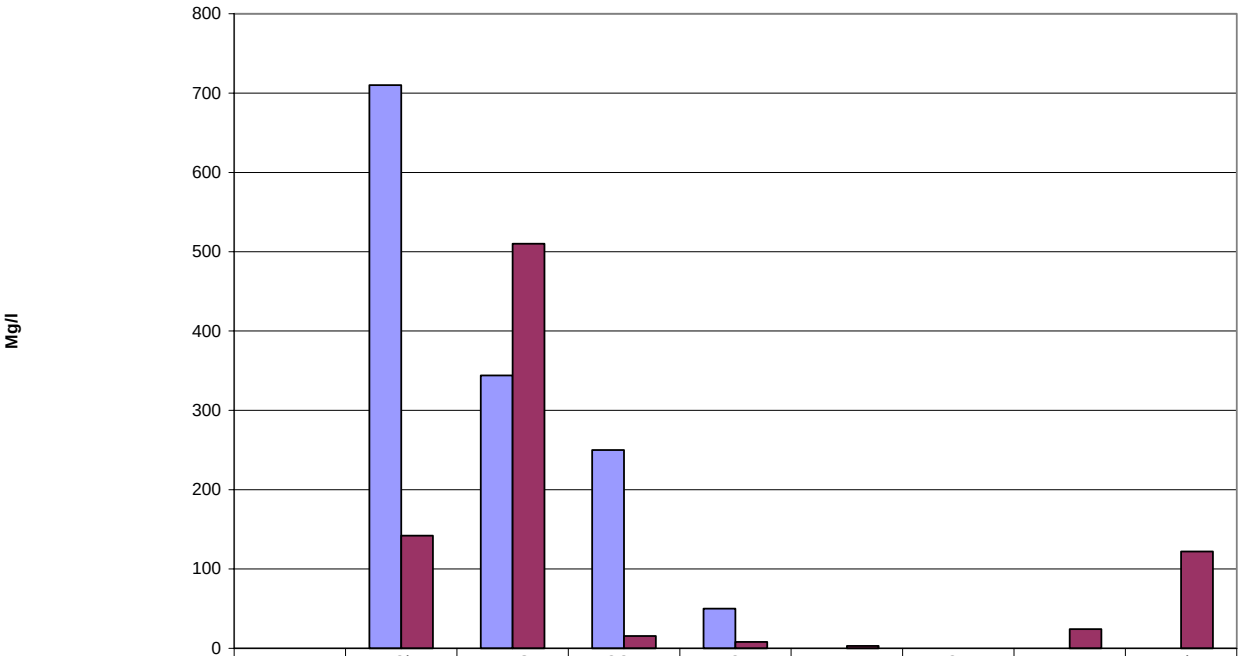
Water quality item			Standard	Unit	Paper factory
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	○
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Paper factory

Fen.	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Ts	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	3	500	10	6.5-9.5	40	
<1.0	0.1	330	2600	4700	2000	3.02	0	28.05	16.19	16.8	70.6	65.22	22.7	0.77	0.6	3	0.49	6	1028	7.7	4080	120	8.31	21	Abdlatif badinkji factory
	0	710	344	235	50	0	0.01	0.07	0.009	10^{-4}x21	0.004	0.002	0.25	10^{-2}x1	1.2	8	55	3	320	1.1	364	54	8.56	17	DEZ Paper Factory
	0	142	310	15.6	6	2.8	0	24.2	122	8x10[illegible]	0.06	443	389	0.79	0	0	2.2	1.22	216	0.1	0	0	8.05	17.1	Alnaamah Company for Carton

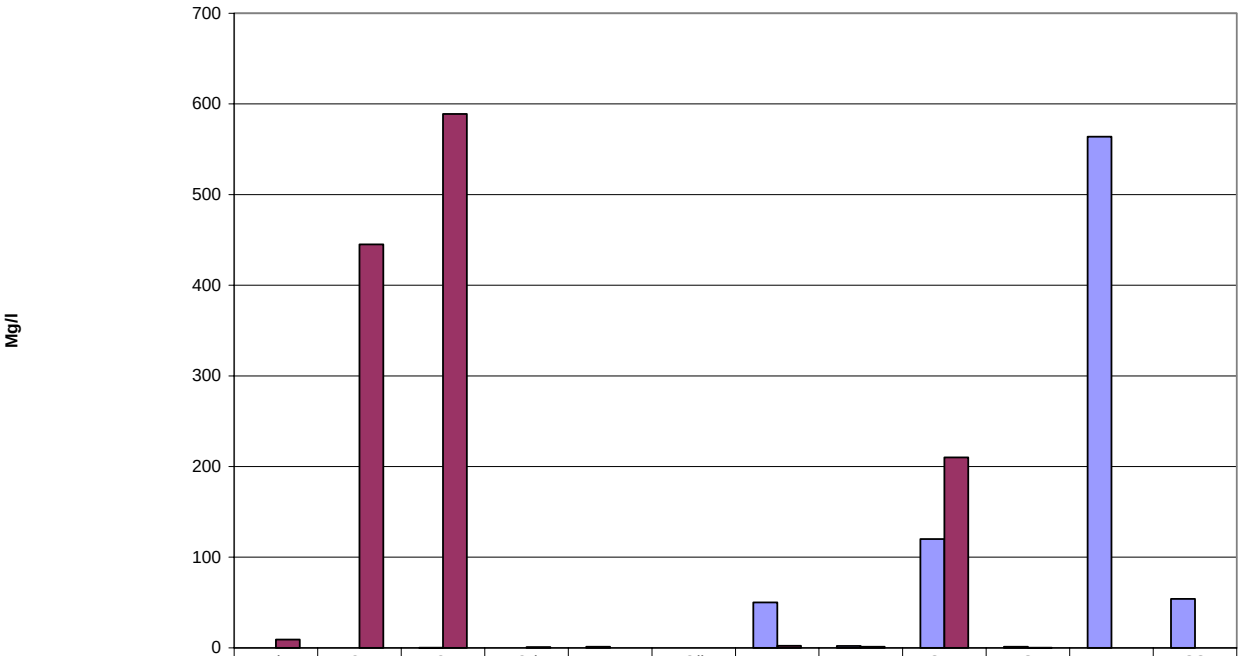
Paper Factories



	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni
Abdlatif badinkji factory	0	710	344	250	50	0	0.01	0.07	0.008
DEZ Paper Factory	0	142	510	15.6	8	2.8	0	24.2	122

Parameters

Paper Factory



	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	SS
Abdlatif badinkji factory	0.004	0.002	0.09	0	1.2	0	50	2	120	1.1	564	54
DEZ Paper Factory	9.06	445	589	0.79	0	0	2.2	1.25	210	0.1	0	0

Parameter

1.2.4 Food factory

Company Name	Location	Sample
Somar Canning Factory for Meat	R Damascus	1
Al Shark Cheese Company	R Damascus	1
General Co. for meat Damascus	Damascus	1
Damascus Yeast Factory	R Damascus	2
Syrian-Saudi Arabia company	R Damascus	1
Flour Milk (Gohta)	R Damascus	1
Barada Company For Beer	R Damascus	1
Arab company for Alcohol Production	Al Swedah	1
General Company for meat Al-Hassakeh	Al Hassakeh	1
General Company for meat Al-Raqah	Al Raqah	1

Water quality item			Standard	Unit	Food factory
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	
12	Cadmium	Cd	0.1	mg/L	
13	Cr^{6+}	Cr	0.1	mg/L	
14	Calcic Chromium	Cr	2.0	mg/L	
15	Copper	Cu	0.1	mg/L	
16	Lead	Pb	0.1	mg/L	
17	Mercury	Hg	0.01	mg/L	
18	Nickel	Ni	2.0	mg/L	
19	Selenium	Se	1.0	mg/L	
20	Zinc	Zn	4.0	mg/L	
21	Cyanide	CN	0.5	mg/L	
22	Arsenic	As	0.1	mg/L	
23	BOD	BOD	800	mg/L	○

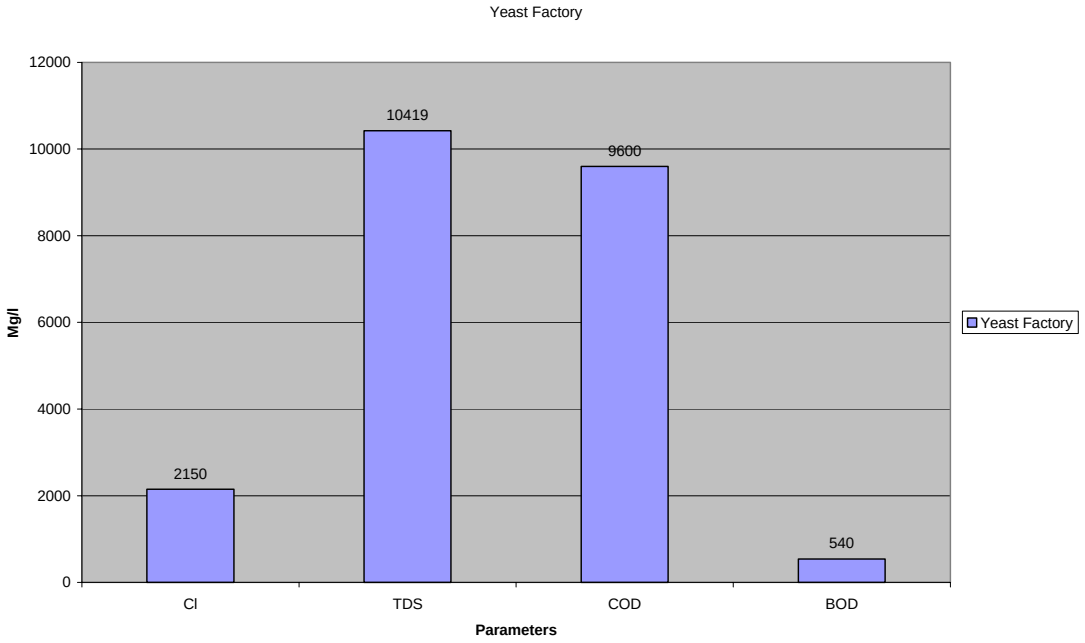
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	
*	Silver	Ag	1.0	mg/L	
*	Phenol Compounds	-	2.0	mg/L	
*	Detergents	ABS	5	mg/L	*

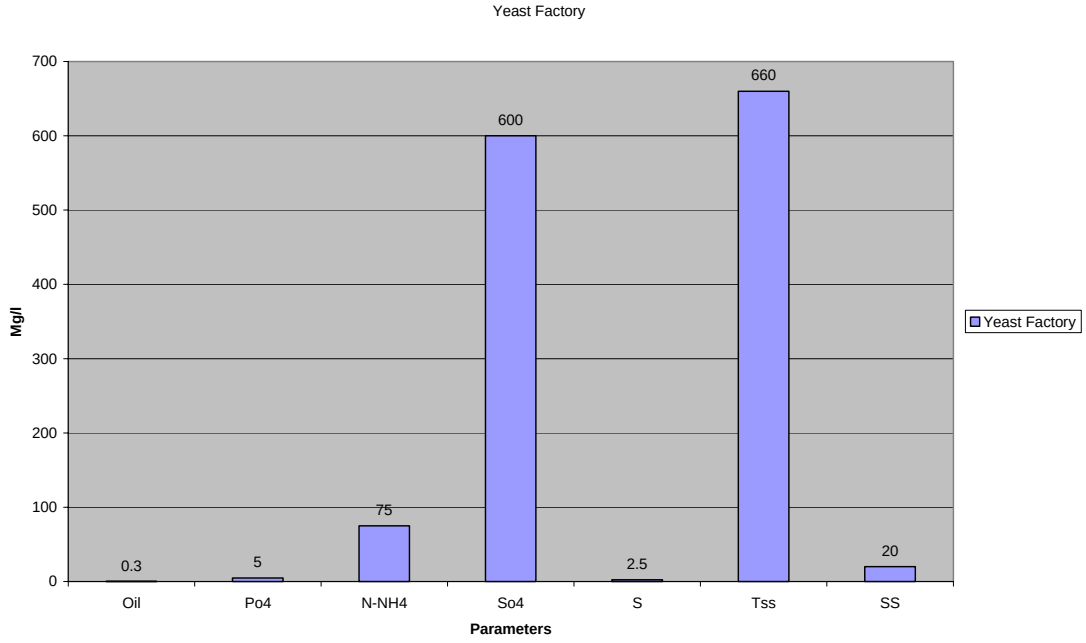
Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Food

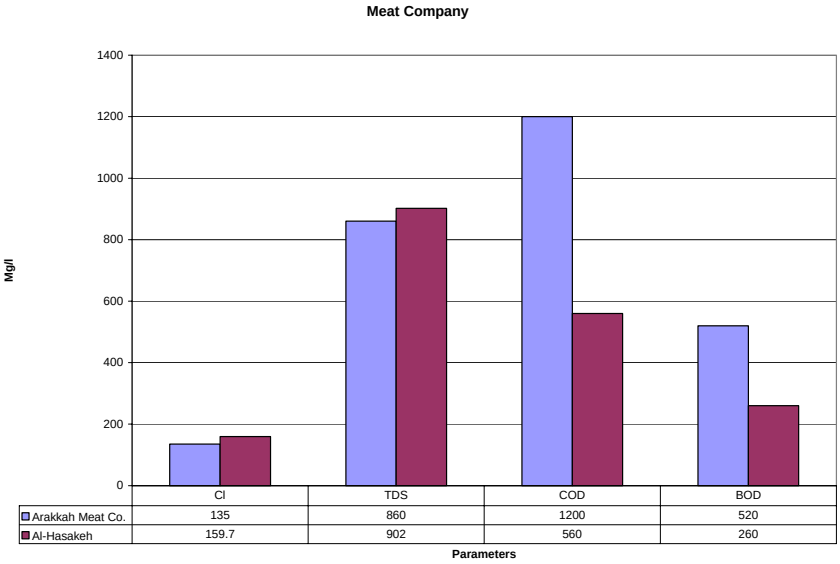
Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Pod	N-NH4	Sul	S	Tn	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	300	1	500	10	6.5-9.5	35	
		231	979.2	9600	2800											0	0.3	13	210	1.6	445	20	6.68	13	Somar Canning Factory for Meat
	-	236	1278	1520	400											-48.9	2.1	2.5	130	0.12	198	6	7.08	17	Al Shark Cheese Company
		175	624	44360	1600											0.8	25	80	800	3	318	16	7.6	11	General Co. for meat
		2136	10419	9600	840											0.5	5	75	600	2.2	600	20	6.1	27	Damascus Yeast Factory-B
		1196	6404	2780	4800											0.3	5	300	430	2.3	1020	48	7.8	22	Damascus Yeast Factory-A
		20	1758	776	144											6	8.5	10	8	1.1	28.4	29	7.3	19	Syrian-Saudi Arabia company
		80	450	2688	1600											0.3	20	20	360	1.2	465	52	6.2	21	Flour Milk (Gohta)
		30	828	7408	13400											0.8	20	17.5	80	1.8	111.6	29	9.3	16	Barada Company For Beer
		26.4	312	48	22											0	0.21	0.3	0	9	28	0.1	8.02	41	Arab company for Alcohol Production
		123	860	1300	320											0.6	31	19	600	3.2	410	68	7.65	17	General Company for meat Al-Hassakeh
		156.7	902	360	260											0	120	80	15.24	0.18	780	471	8.00	17	General Company for meat Al-Raqah

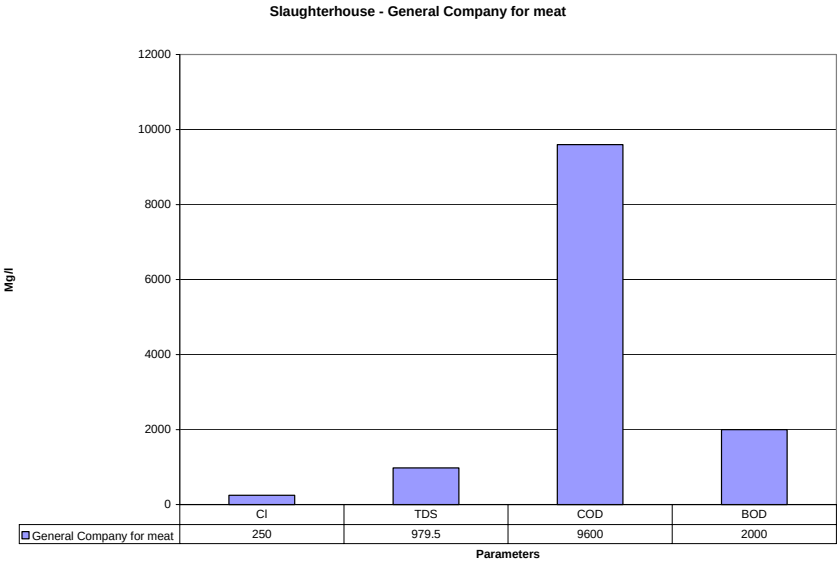
(1) Yeast Factory

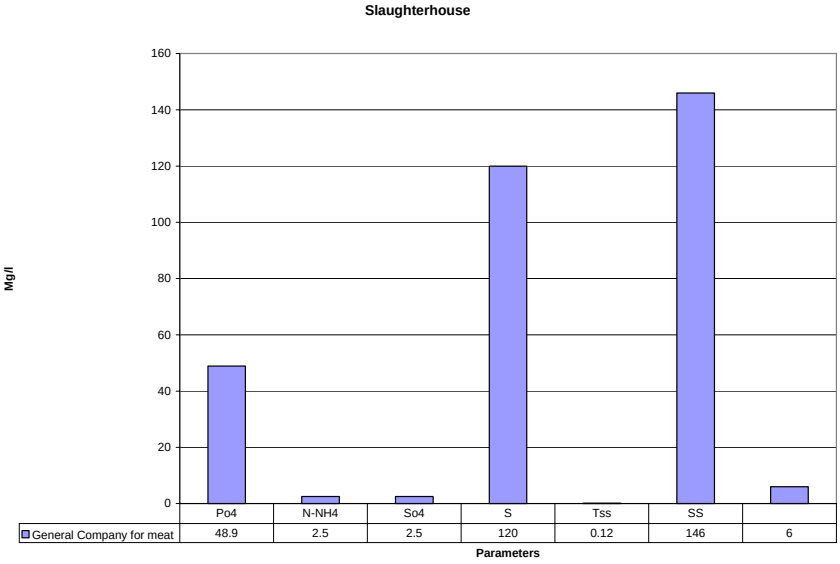




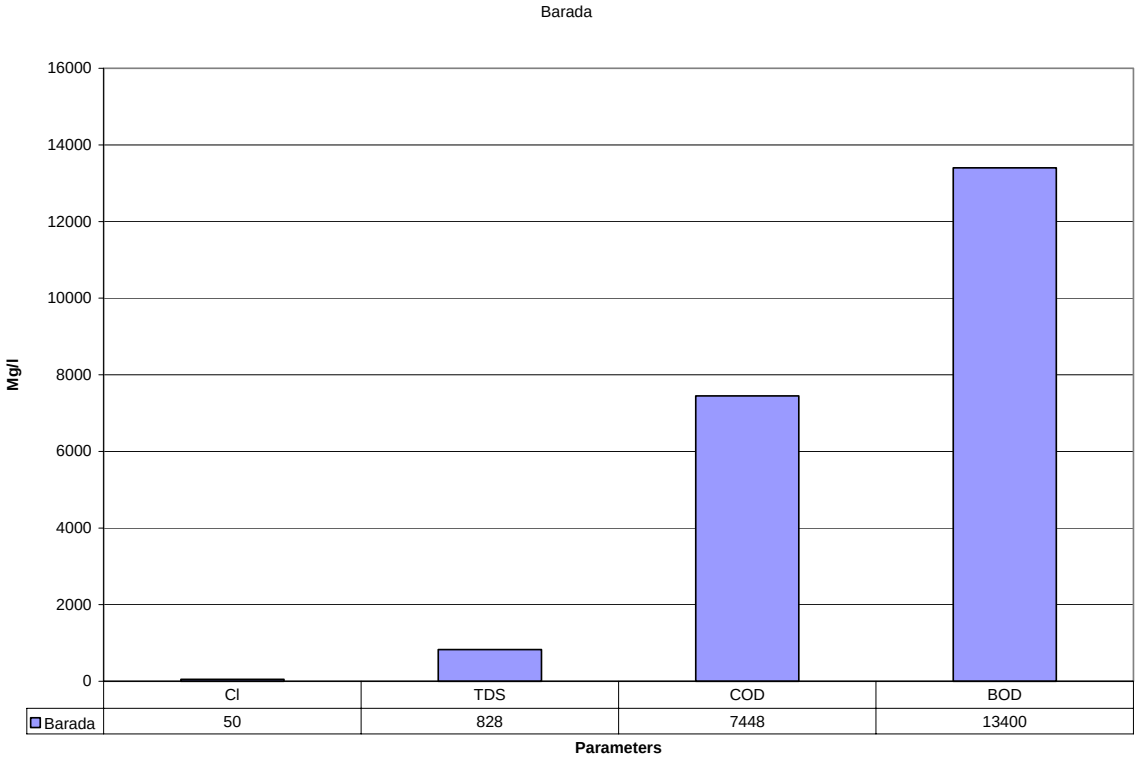
(2) Slaughterhouse Factories:

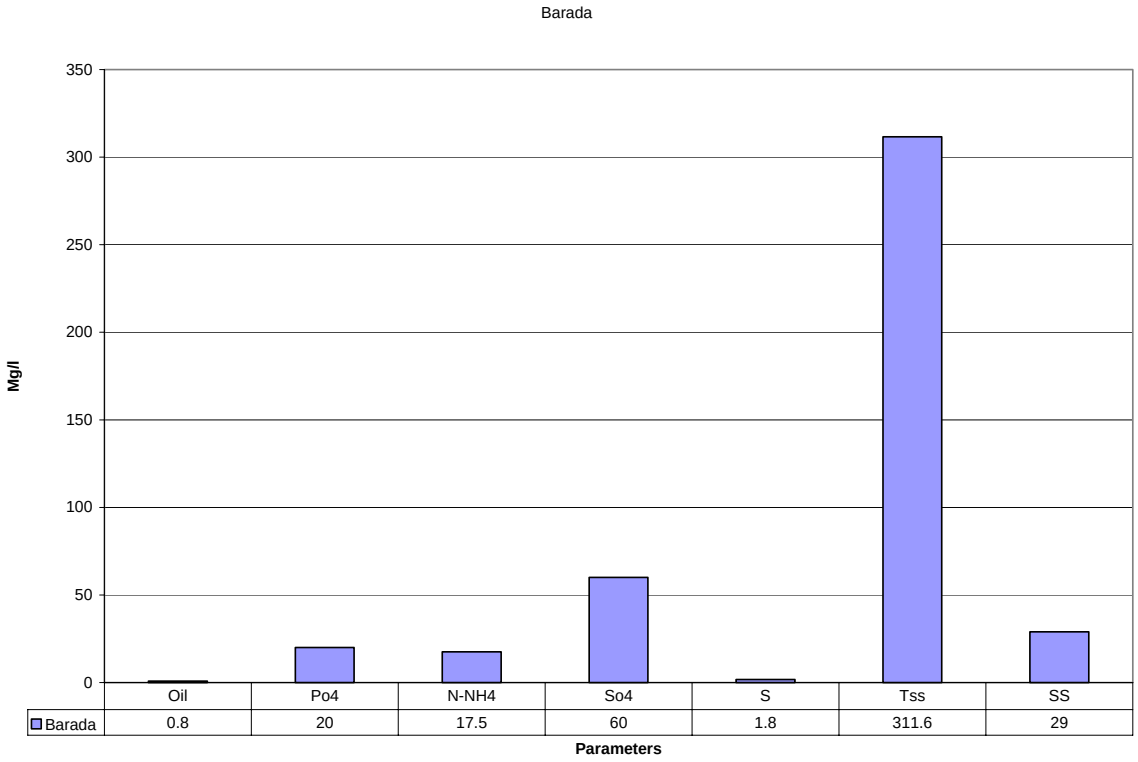


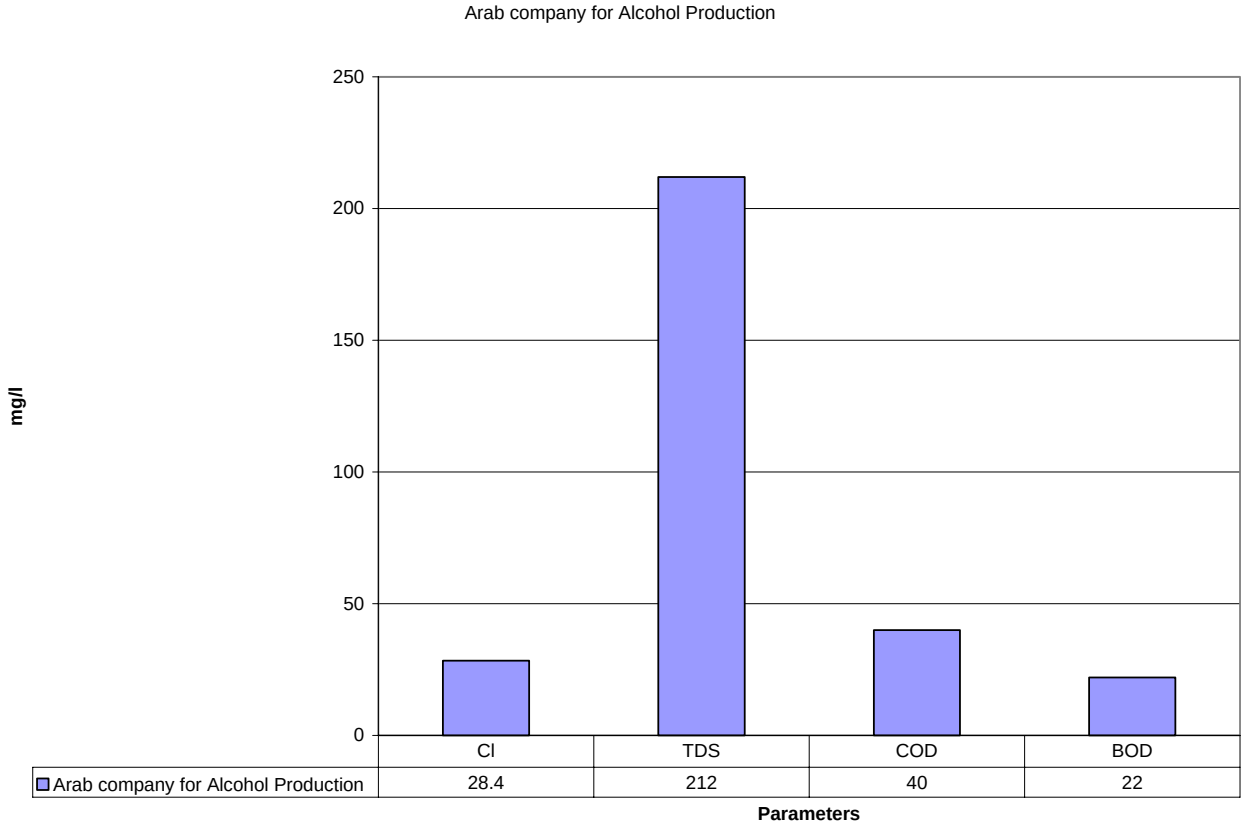


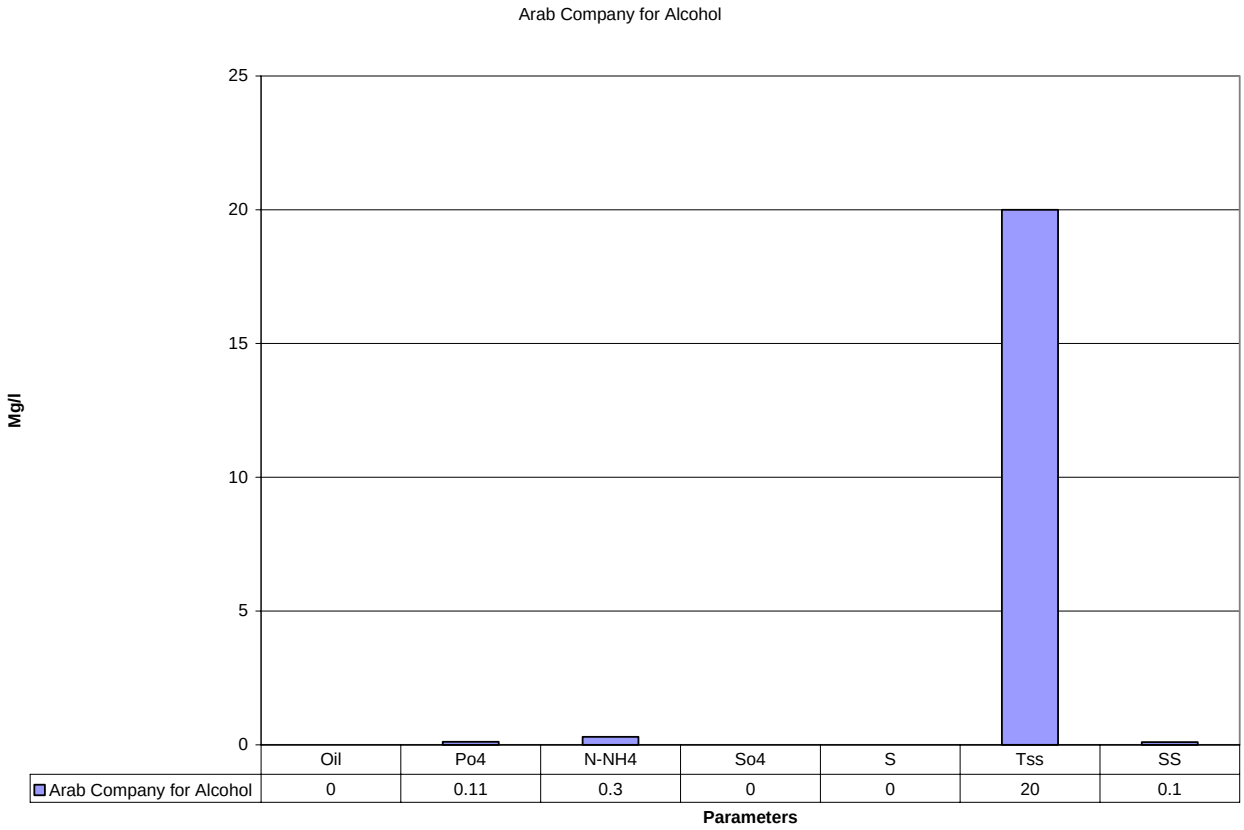


(3) Beer/ Alcohol Factories

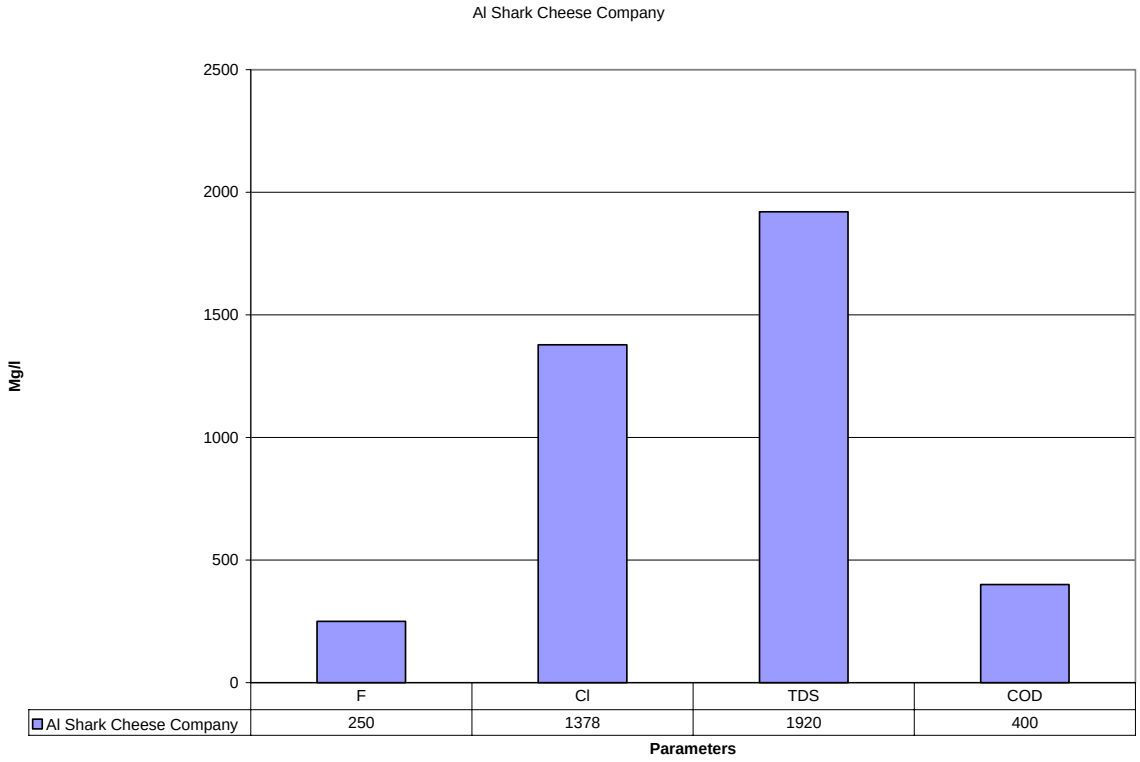


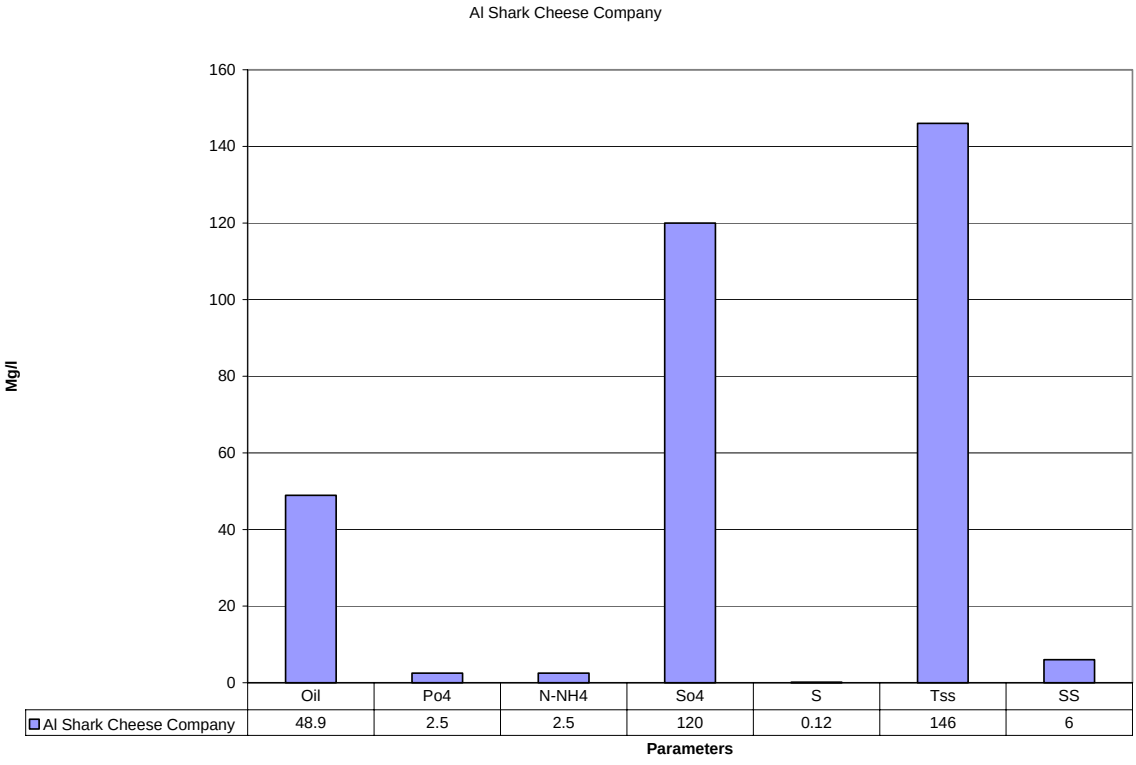



Arab company for Alcohol Production
mg/l
250
200
150
100
50
0
Cl
TDS
COD
BOD
Arab company for Alcohol Production
28.4
212
40
22
Parameters

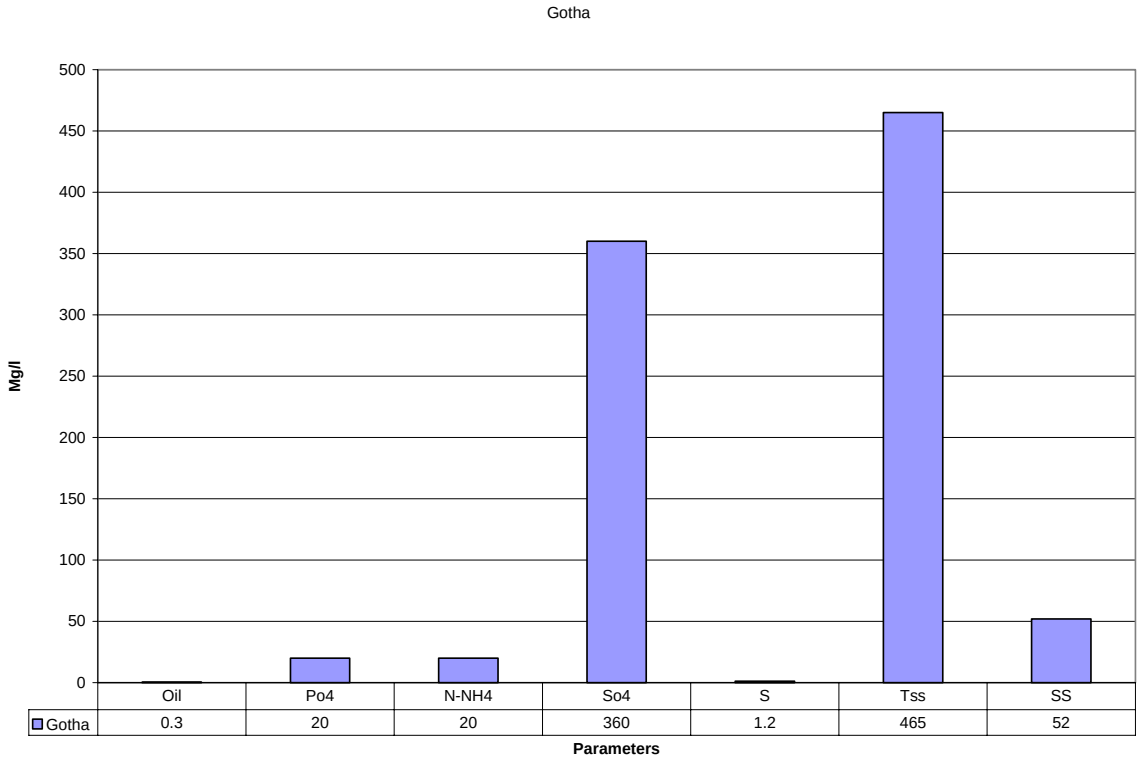

Arab Company for Alcohol
Mg/l
25
20
15
10
5
0
Oil
Po4
N-NH4
So4
S
Tss
SS
Arab Company for Alcohol
0
0.11
0.3
0
0
20
0.1
Parameters

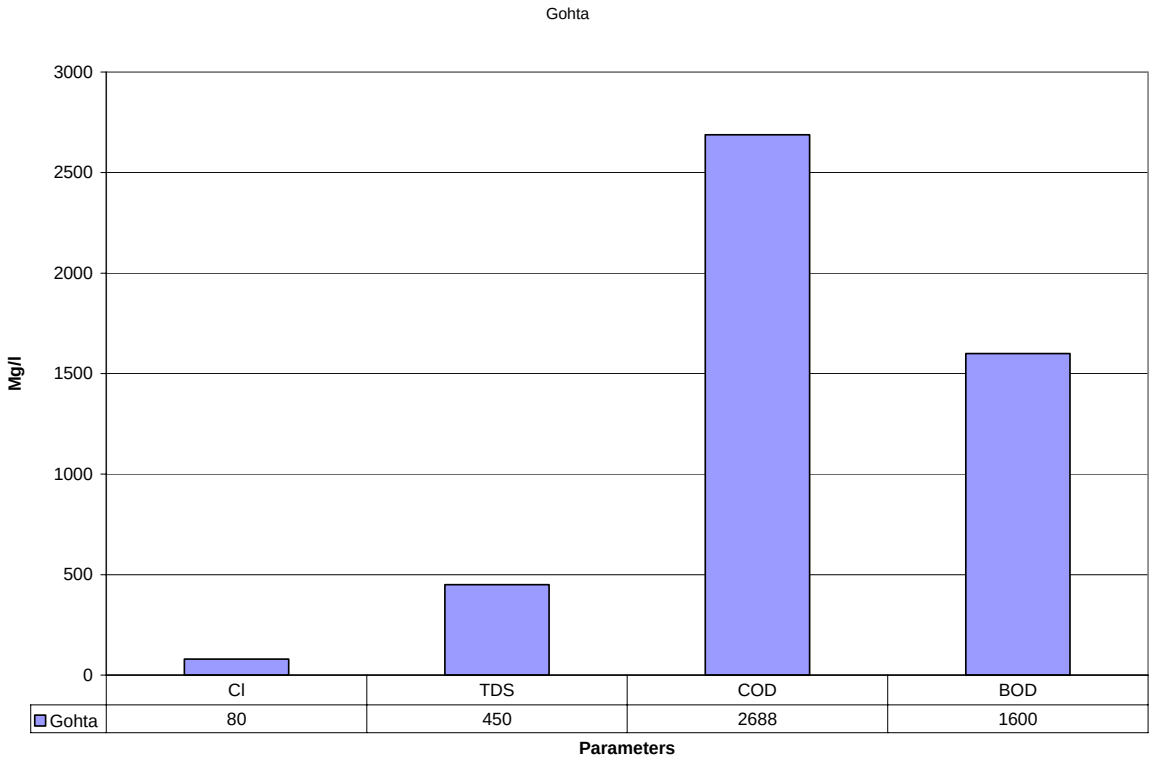
(4) Dairy & Cheese Products Factory:





(5) Flour Milk Factory:





1.2.5 Other Factories

(1) Tannery factory

Company Name	Location	Sample
General Tannery Company	Damascus	3
Dnno Tannery factory	Damascus	1
Assi Tanerry	Damascus	1
Twailaty Tanerry	Damascus	1

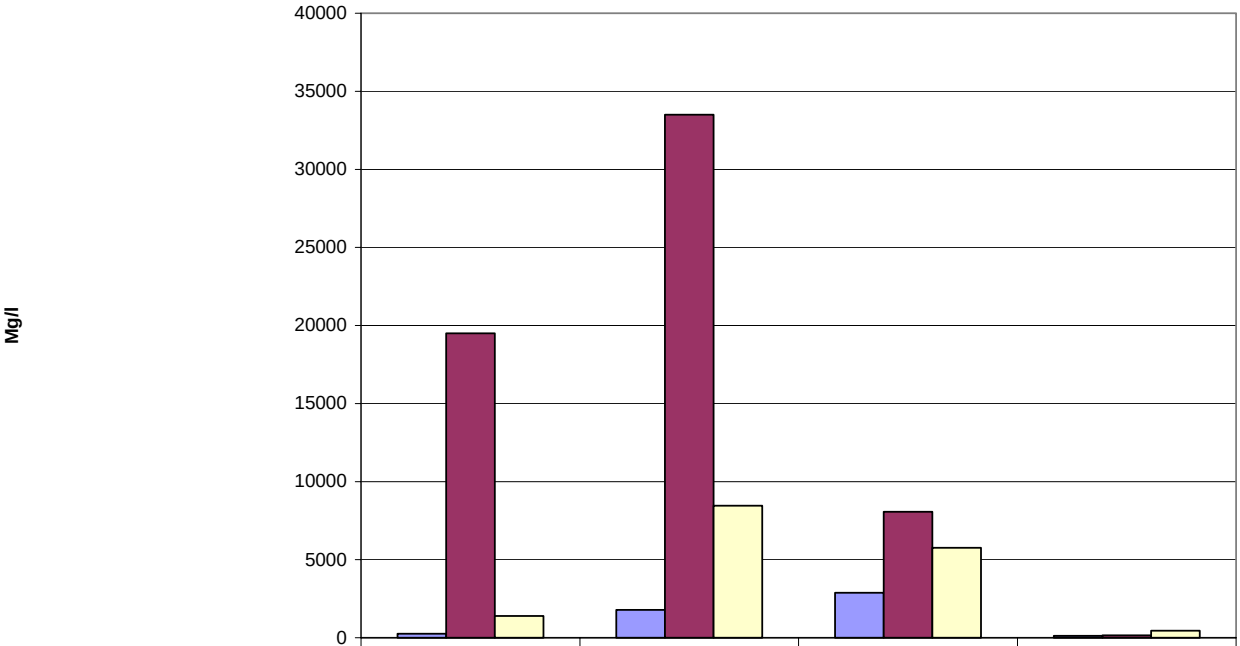
Water quality item			Standard	Unit	Tannery
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Tannery

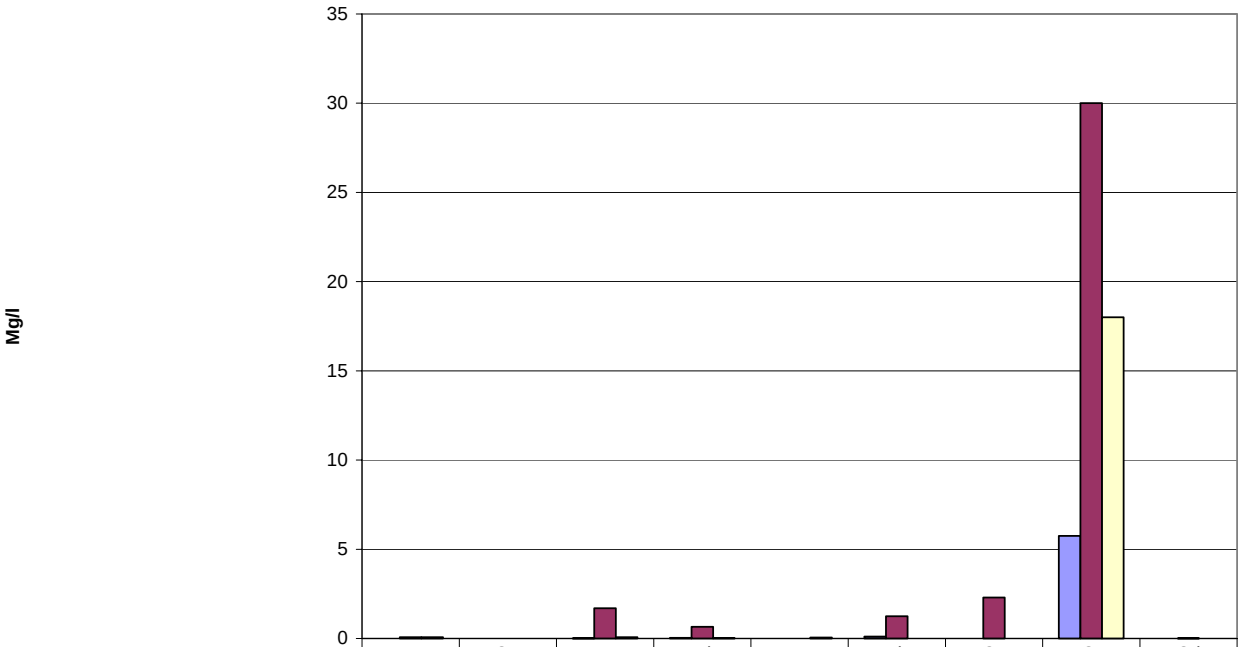
Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Pos	N-NH4	SO4	S	Ten	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1000	800	0.1	0.5	4	2	0.01	0.1	0.2	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.5	35	
	3.6	267	1780	2885	120	0.001	0	0.005	0.04	0.002	0.11	0.002	3.75	0	1.4	1	110	3	1800	0.12	390	11	7.2	11	General Tannery Company outlet
	0	16500	23500	8064	550	0.075	0	1.7	0.46	0	1.25	2.3	30	0.008	4.6	1	7.5	31	1800	0.11	1992	180	6.5	17	General Tannery Company outlet-Crom
	1.3	1400	8400	3760	450	0.375	0	0.087	1.02	0.044	0.001	0	19	0.0001	3.5	0	1	85	2100	0.55	756	36	6.8	13	General Tannery Company outlet-Coloring
	0	3750	18100	10044	1100	0.006	0	0.18	0.11	0.007	0.08	0.006	1.25	0	2.7	1	6	59	3000	3.3	880	1.6	6.9	19	Dimo Tannery factory
	3	3200	13920	141.6	960	0.0020	0	0.34	0.28	0.75	0.01	0.003	0.042	0.005	1.5	1	60	22	850	4.8	310	37	7.3	12	Azzi Tannery
	0	4800	3044	2940	532	2.075	-	0.23	0.69	0.3	0.062	0.011	12	0.006	0.7	1.0	1.2	600	1750	5.3	614	45	7.6	11	Twailaty Tannery

Tannery



	Cl	TDS	COD	BOD
General Tannery Company outlet	260	1780	2880	120
General Tannery Company Crom	19500	33500	8064	160
General Tannery Company Coloring	1400	8460	5760	450

Tannery



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd
General Tannery Company outlet	0.001	0	0.005	0.04	0.002	0.11	0.002	5.75	0
General Tannery Company Crom	0.075	0	1.7	0.66	0	1.25	2.3	30	0.008
General Tannery Company Coloring	0.075	0	0.067	0.02	0.048	0.001	0	18	0.0001

(2) Textile factory

Company Name	Location	Sample
General Company for Carpet production	Damascus	1
Arabian United Co. for Industry DUBS	Damascus	1
Modern Industries Corporation	Damascus	1

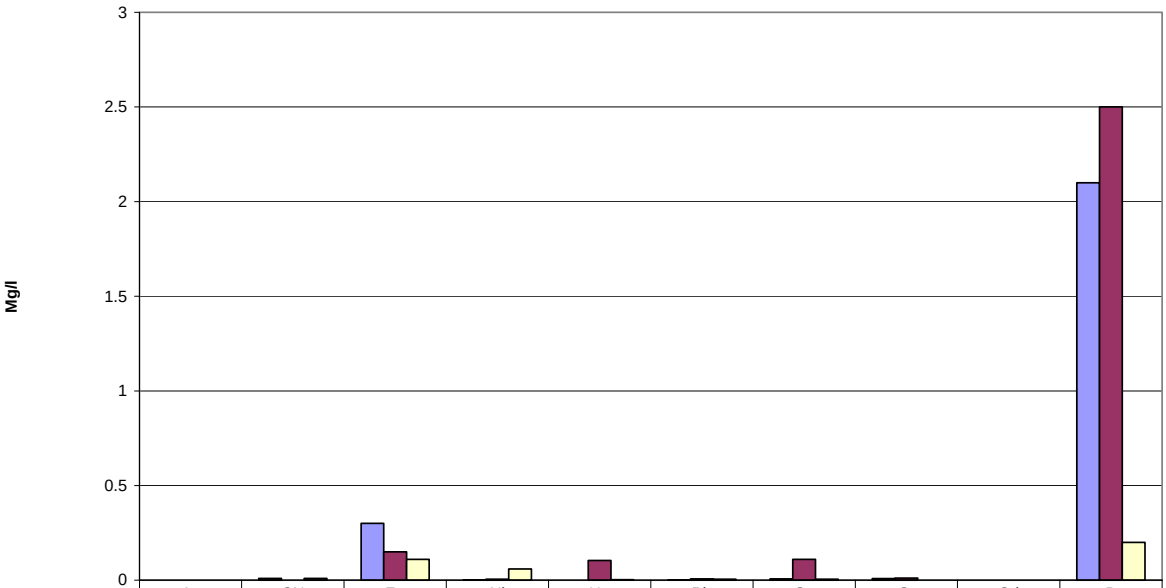
Water quality item			Standard	Unit	Textile / Clothing
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Textile

Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.002	5	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.5	35	
	0.07	750	1488	7296	340	0	0.01	0.3	0.001	0	0.005	0.007	0.009	0	2.1	0	2.5	125	300	1.6	4000	100	7	18	General Company for Carpet production
	0.99	306	2145	1950	460	0	0	3.15	0.020	0.004	0.007	0.11	0.012	0	2.5	0	17.5	15	350	0.75	806	33	8.59	14	Arabian United Co. for Industry DUBS
	1.5	1250	4981	1568	40	0	0.01	0.11	0.06	0.003	0.009	0.004	0	0	0.2	0.3	0.2	7.5	160	0.04	258	34	4.37	14	Modern Industries Corporation

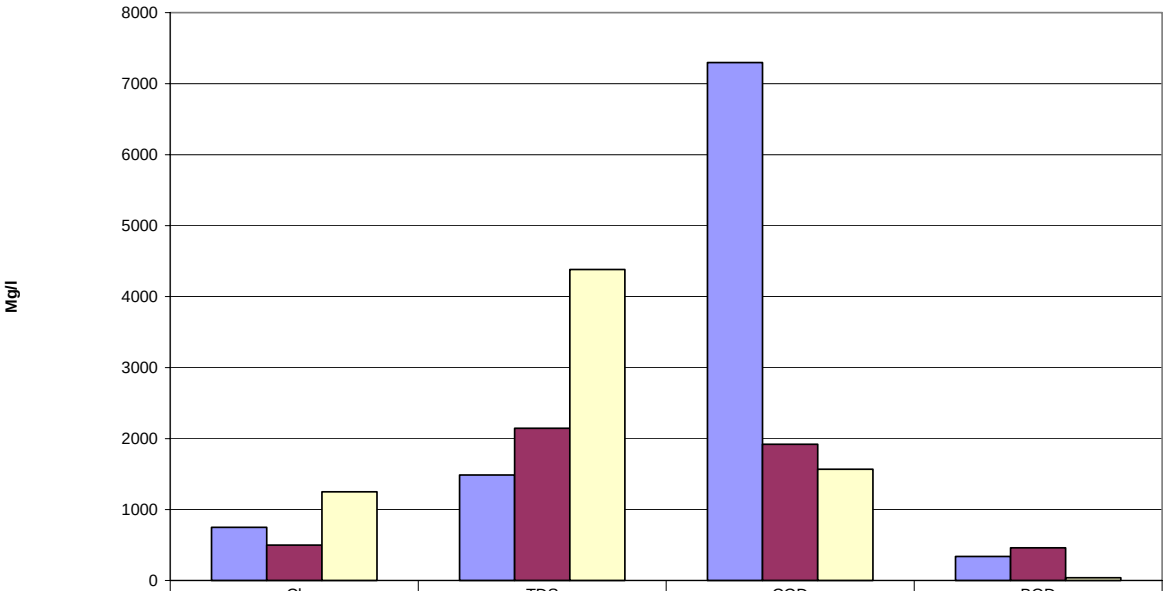
Textil Industry



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B
Carpet	0	0.01	0.3	0.001	0	0.001	0.007	0.009	0	2.1
DUBS	0	0	0.15	0.005	0.104	0.007	0.11	0.012	0	2.5
Modern Ind.	0	0.01	0.11	0.06	0.003	0.005	0.005	0	0	0.2

Parameters

Textil Industries



	Cl	TDS	COD	BOD
Carpet	750	1488	7296	340
DUBS	500	2145	1920	460
Modern Industry	1250	4381	1568	40

Parameters

(3) Painting factory:

Company Name	**Location**	**Sample**
Ahmed Burguly	R Damascus	1
Jobico	R Damascus	1
Alazmeh for Panting	R Damascus	1

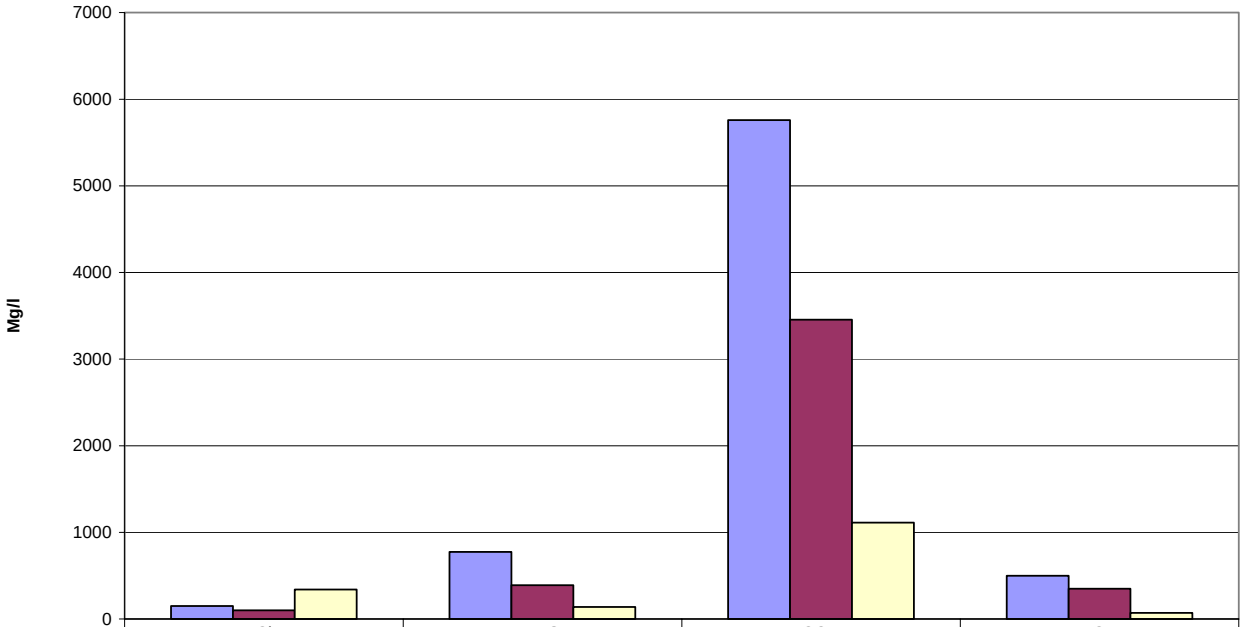
Water quality item			Standard	Unit	Painting
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Painting

Pest.	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Su	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.5	35	
	0	150	775	1760	550	0	0	0.1	0.01	0	0.02	0.19	0.38	0.0008	0.3	145	87.5	60	75	0.3	333	30	6.87	20	Ahmad Borguly
	0	100	300	1450	150	0	0	0.2	0.11	0	0.08	0.006	0.001	0.0033	0	42.4	25	21	7	0.18	76	2	6.6	12	Jobico
	0	340	1382	1113	75	0	0.01	0.006	0.001	0	0.005	0.013	0	0.006	0.6	63.1	20	2.75	360	0.75	201	41	7.7	11	Alazmeh for Painting

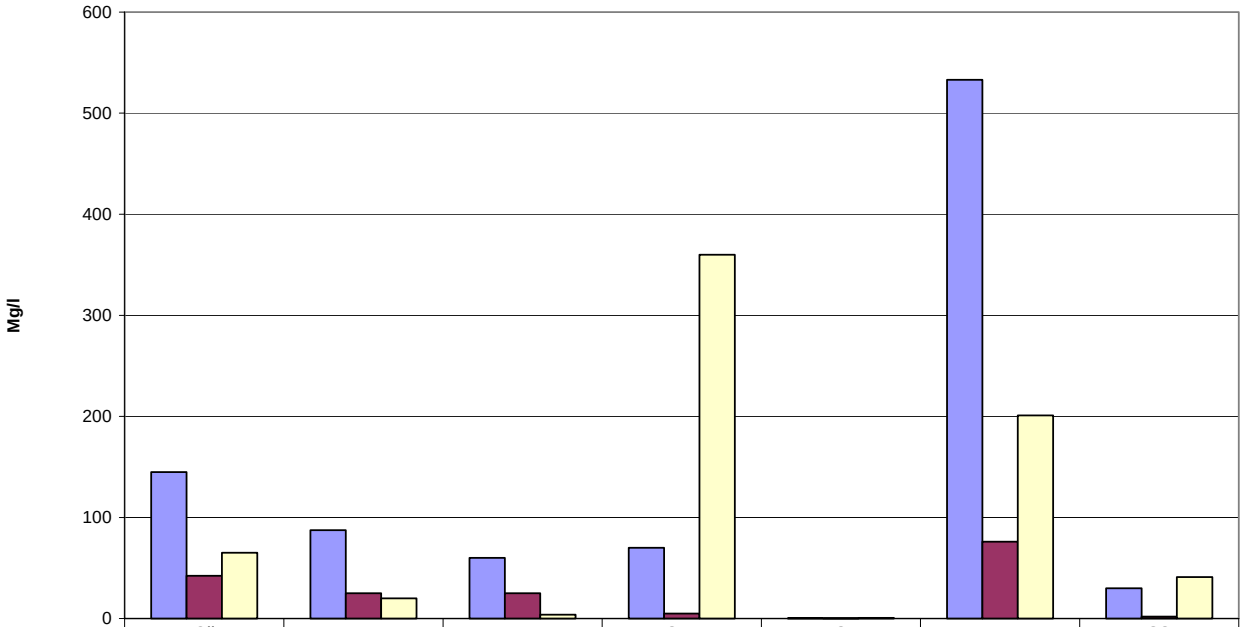
Paiting Factories



	Cl	TDS	COD	BOD
Burguly	150	775	5760	500
Jobico	100	390	3456	350
Alazmeh	340	139.2	1113	70

Parameters

Painting Company



	Oil	Po4	N-NH4	So4	S	Tss	SS
Burguly	145	87.5	60	70	0.3	533	30
Jbico	42.4	25	25	5	0.18	76	2
Alazmeh	65.1	20	3.75	360	0.75	201	41

Parameters

(4) Electroplating factory:

Company Name	Location	Sample
Dia Kuzbari	R Damascus	1
Mohamed Hawasli	R Damascus	1
Tecani for Elect	R Damascus	1

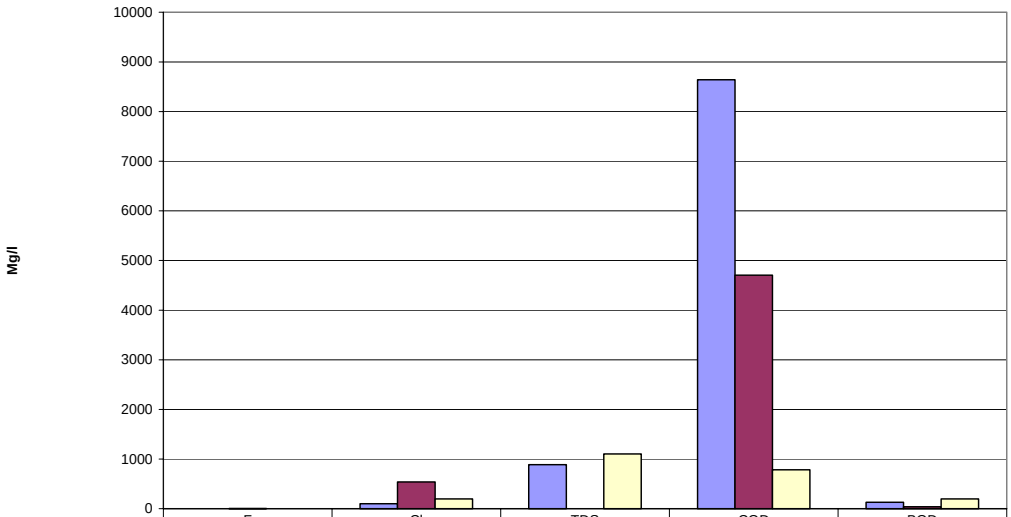
Water quality item			Standard	Unit	Electroplating
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Electroplating

Fen.	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	150	3	800	10	6.5-9.5	35	
	0.7	153	886.6	8690	118	0	0.01	0.8	2.77	0	0.001	0.3	0.02	0.0003	3.7	3	4	1	800	1.4	128	15	6.9	14	Dia Kurbari
	1.2	540		4704	40	0	0.01	85	36.6	0	0.01	6	7.4	0.0001	6.3	0	5	73	125	0.015	31	12	8.3	12	Mohamed Hawash
	0.7	200	1101.4	784	200	0	0	0.17	252.7	0	0.20	0.3	0.187	0.008	25	0	0.2	2.5	159	1.8	104	2	7.1	16	Tecani for Elect

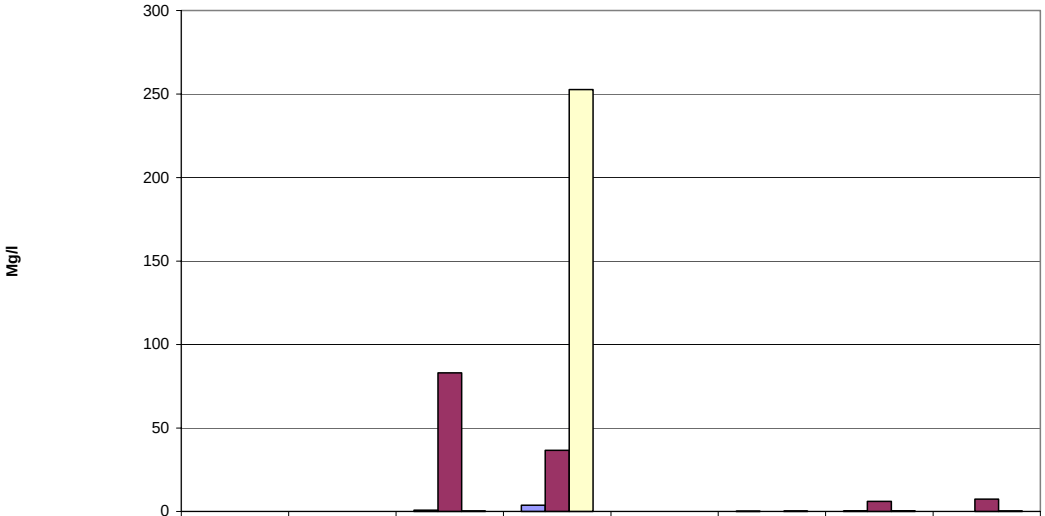
Electroploting Companies



	F	Cl	TDS	COD	BOD
Dia Kuzbary	0.7	100	886.6	8640	130
Mohamed Hawasli	3.2	540		4704	40
Tecani	0.7	200	1103.4	784	200

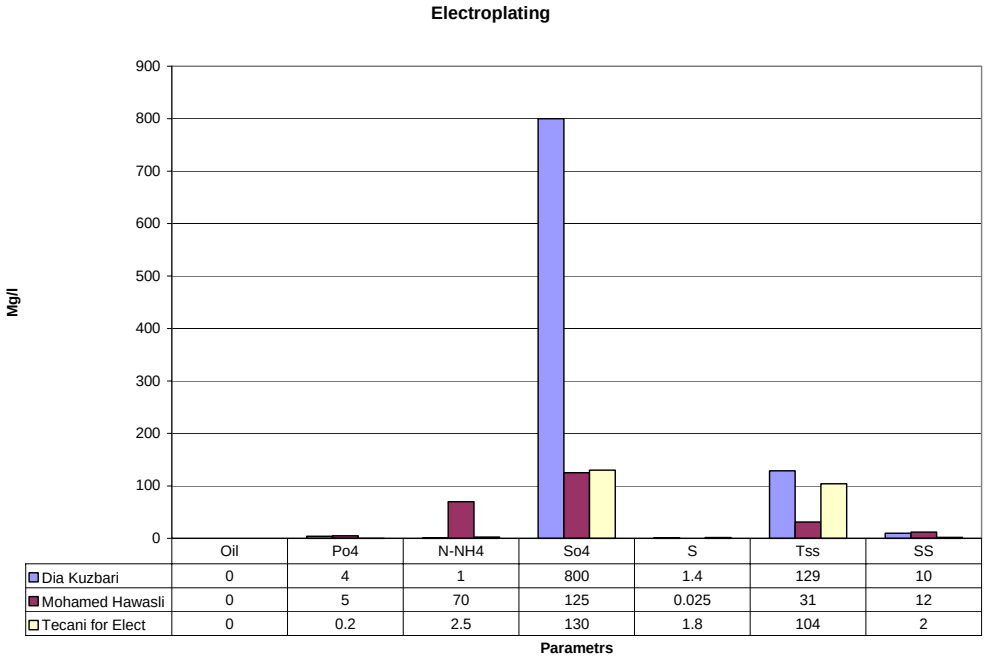
Parameters

Electroplating



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr
Dia Kuzbari	0	0.01	0.8	3.77	0	0.031	0.3	0.02
Mohamed Hawasli	0	0.01	83	36.6	0	0.01	6	7.4
Tecani for Elect	0	0	0.17	252.7	0	0.25	0.3	0.187

Parameters



	Oil	Po4	N-NH4	So4	S	Tss	SS
Dia Kuzbari	0	4	1	800	1.4	129	10
Mohamed Hawasli	0	5	70	125	0.025	31	12
Tecani for Elect	0	0.2	2.5	130	1.8	104	2

(5) Oil refinery factory:

Company Name	Location	Sample
Banias Oil Refinery	Tartous	1
ALAQSA for OIL	R Damascus	1
Hager For Oil	R Damascus	1

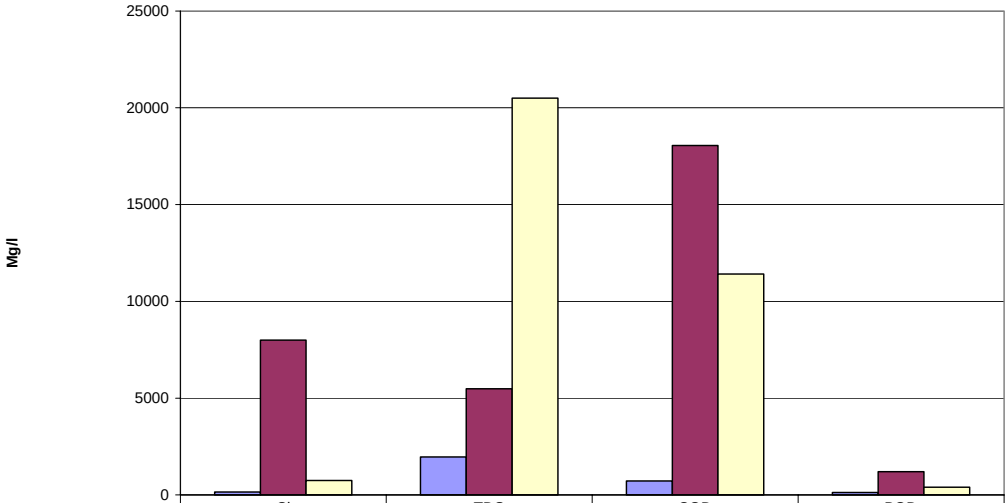
Water quality item			Standard	Unit	Oil refinery
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Oil refinery

Fen.	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	DS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	5	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	800	10	6.5-9.5	30	
	1.05	173	1960	720	130	4.5	0	<0.05	0.27	0	<0.1	<0.06	<0.13	0.001	1	5	0.01	8	84	0.1	53	8	7.49	19	Banias Oil Refinery
	2	8300	3484	18048	1550	0.003	0.01	0.1	0.21	0	0.006	0	0.08	0	0	0.8	10	23	120	0.7	423	16	7.09	11	ALAQSA for OIL
	3	750	20550	11402	400	0.008	0	78	1.33	0	0.07	0.01	0.718	0.0005	2.9	37.7	200	153	160	1.8	1110	96	2.1	14	Hager For Oil

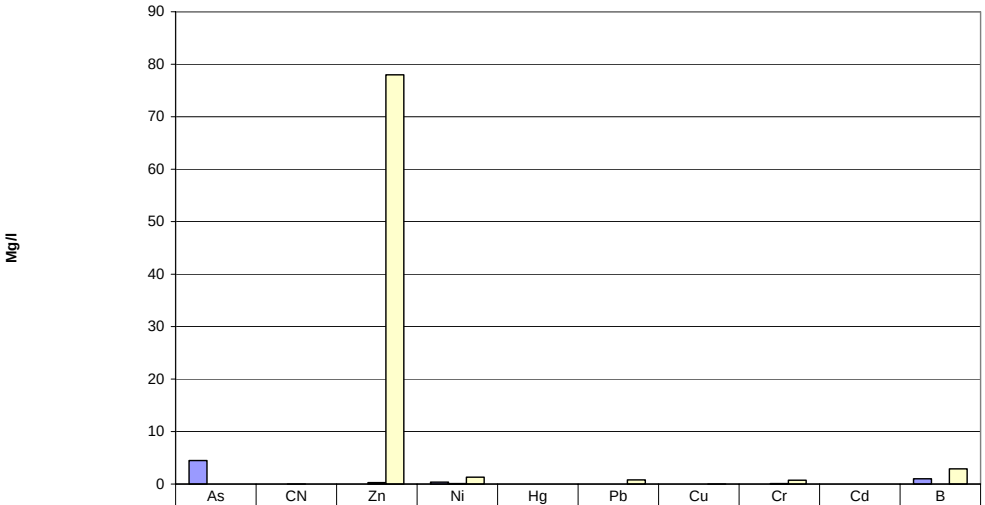
OIL REFINERY



	Cl	TDS	COD	BOD
Banias Oil Refinery	155	1960	720	130
ALAQSA for OIL	8000	5484	18048	1200
Hager For Oil	750	20500	11412	400

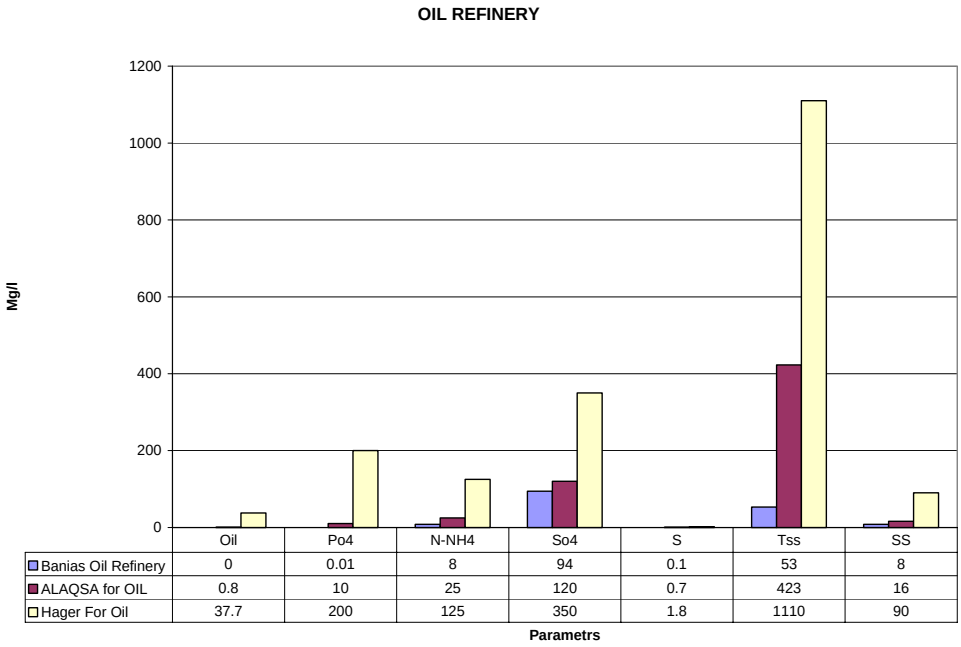
Parametres

OIL REFINERY



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B
Banias Oil Refinery	4.5	0	0	0.37	0	0	0	0	0.001	1
ALAQSA for OIL	0.003	0.01	0.3	0.11	0	0.008	0	0.08	0	0
Hager For Oil	0.006	0	78	1.33	0	0.81	0.01	0.718	0.0005	2.9

Parametrs



	Oil	Po4	N-NH4	So4	S	Tss	SS
Banias Oil Refinery	0	0.01	8	94	0.1	53	8
ALAQSA for OIL	0.8	10	25	120	0.7	423	16
Hager For Oil	37.7	200	125	350	1.8	1110	90

(6) Pharmaceutical factory:

Company Name	Location	Sample
Albahri Company	R Damascus	1
Tamico	R Damascus	1
Domina Company	R Damascus	1

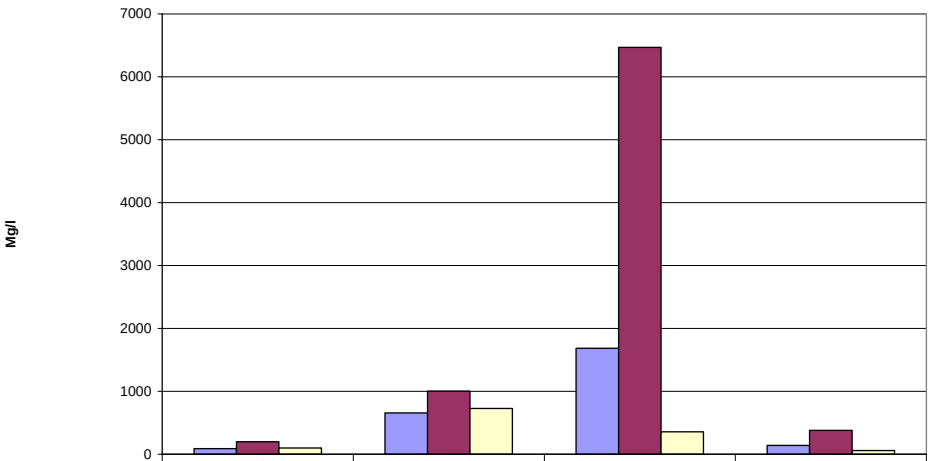
Water quality item			Standard	Unit	pharmaceutical
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Pharmaceutical

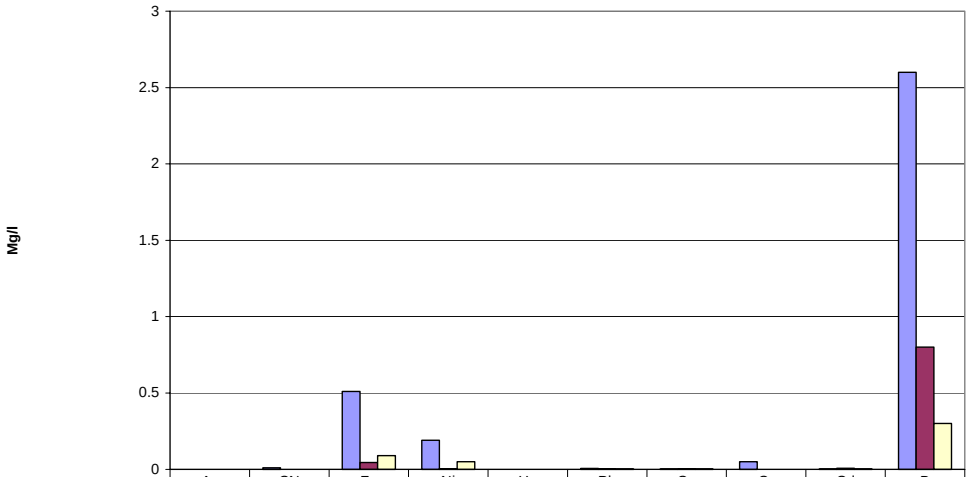
Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Co	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	5	600	2000	1400	800	0.1	0.5	4	2	0.05	0.1	0.1	0.1	0.1	1	10	20	100	100	2	500	30	6.5-9.5	35	
	2	90	619	1084	110	0	0.01	0.51	0.19	0	0.036	0.001	0.05	0.001	2.6	0.5	6	5	11	0.47	389	38	7.25	24	Albahri Company
	0	253	1361.8	6468	380	0	0	0.044	0.008	0	0.003	0.004	0	0.007	0.8	38.9	1.25	6	69	0.0	39.2	17	8.4	19	Tamico
	0	100	729	237	60	0	0	0.09	0.05	0	0.002	0.001	0	0.002	0.5	0	0.2	2.5	150	0.06	14	0.1	6.9	18	Domina Company

Pharmaceutical

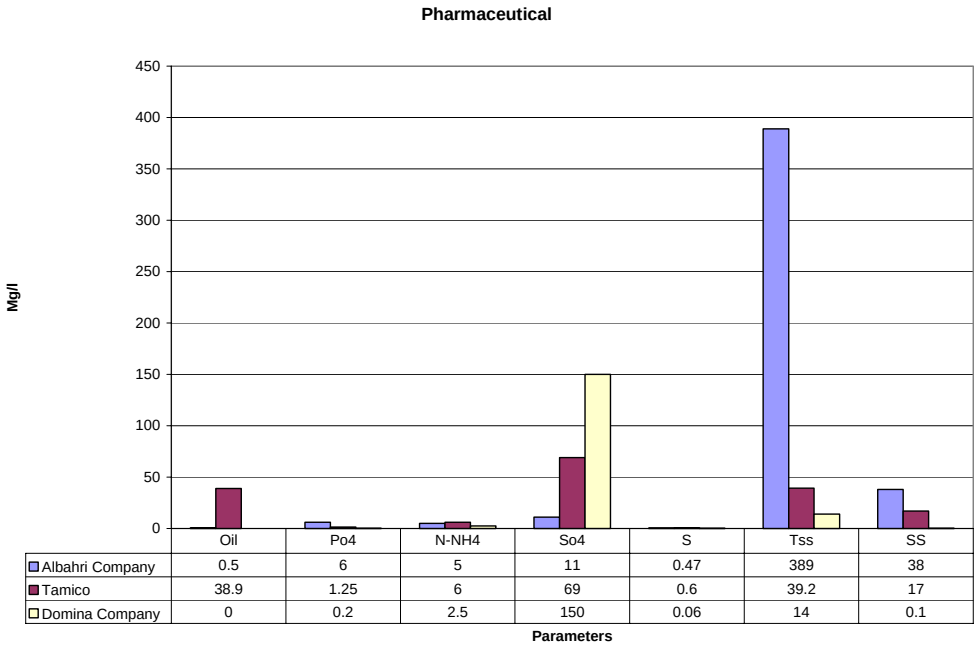


	Cl	TDS	COD	BOD
Albahri Company	90	659	1684	140
Tamico	200	1004.8	6468	380
Domina Company	100	729	357	60

Pharmaceutical



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B
Albahri Company	0	0.01	0.51	0.19	0	0.006	0.001	0.05	0.001	2.6
Tamico	0	0	0.044	0.004	0	0.003	0.004	0	0.007	0.8
Domina Company	0	0	0.09	0.05	0	0.002	0.001	0	0.002	0.3



	Oil	Po4	N-NH4	So4	S	Tss	SS
Albahri Company	0.5	6	5	11	0.47	389	38
Tamico	38.9	1.25	6	69	0.6	39.2	17
Domina Company	0	0.2	2.5	150	0.06	14	0.1

(7) Aluminum factory:

Company Name	Location	Sample
Madar For Aluminum	R Damascus	1
Amoura For Aluminum	R Damascus	2
General Company for Aluminum	Lattakia	1

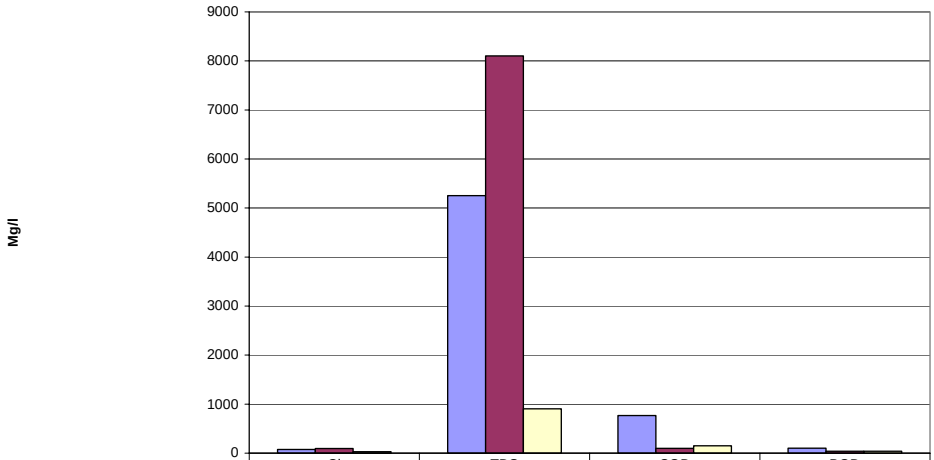
Water quality item			Standard	Unit	Aluminum
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Aluminum

Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Tss	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.003	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	300	10	6.5-9.5	35	
	6	75	5251	748	136	0	0	0.16	21	0.008	0.06	0.01	0.58	0.0006	0.3	54.2	0.2	30	18000	1.2	372	11	6.6	22	Madar for Aluminum
	11.7	99	8100	98	40	0	0	0.41	0.71	3.96	0.016	0.2	0.04	0.0001	11.7	0	0.1	120	9900	0.013	10800	770	7.99	17	Amoura for Aluminum B.T
	1	130	1800	196	30	0.5	0.0	0.012	0.71	0.0	0.005	0.003	0.020	0.0003	1	0	0.2	60	150	0.08	99	5	7.2	17	Amoura for Aluminum A.T
	0.1	33	905	150	40	2	0	<0.02	0.002	0.07	<0.3	<0.08	<0.19	0.004	1.2	0	0.01	0.56	700	0.6	320	30	6.73	33	General Company for Aluminum

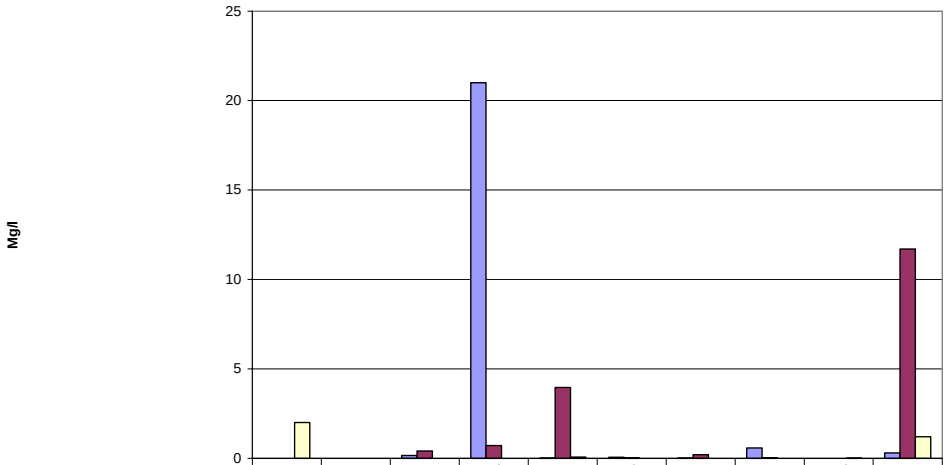
ALUMINUM



	Cl	TDS	COD	BOD
Madar	75	5251	768	100
Amoura For Alaminum	95	8100	98	40
General Company for Aluminum	30	905	150	40

Parameters

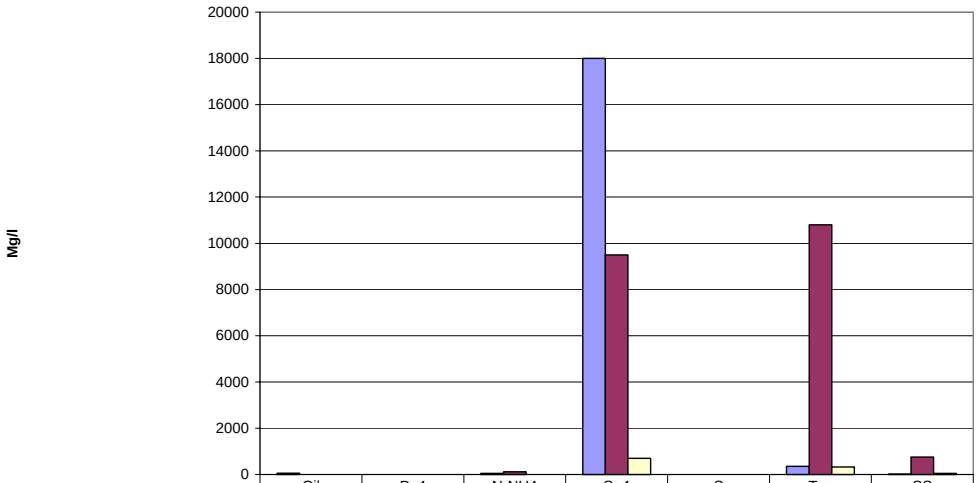
ALUMINUM



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B
Madar	0	0	0.16	21	0.008	0.06	0.01	0.58	0.0006	0.3
Amoura For Alaminum	0	0	0.41	0.71	3.96	0.016	0.2	0.04	0.0001	11.7
General Company for Aluminum	2	0	0	0.002	0.07	0	0	0	0.004	1.2

Parameters

ALUMINUM



	Oil	Po4	N-NH4	So4	S	Tss	SS
Madar	54.2	0.2	50	18000	1.2	352	10
Amoura For Alaminum	0	0.1	120	9500	0.013	10800	750
General Company for Aluminum	0	0.01	0.56	700	0.8	320	50

Parameters

(8) Battery factory:

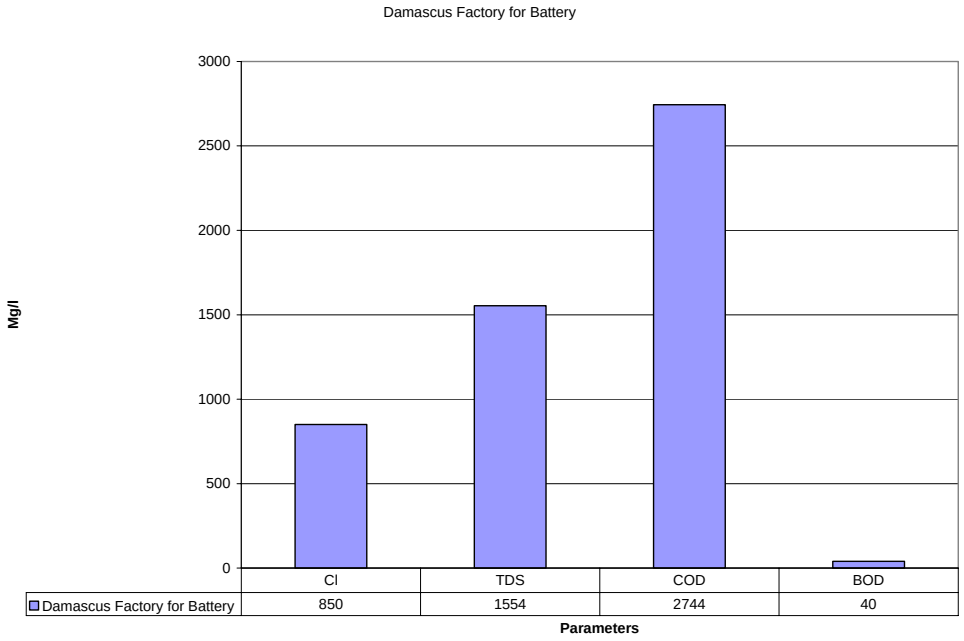
Company Name	Location	Sample
Damascus Factory for Battery	R Damascus	1

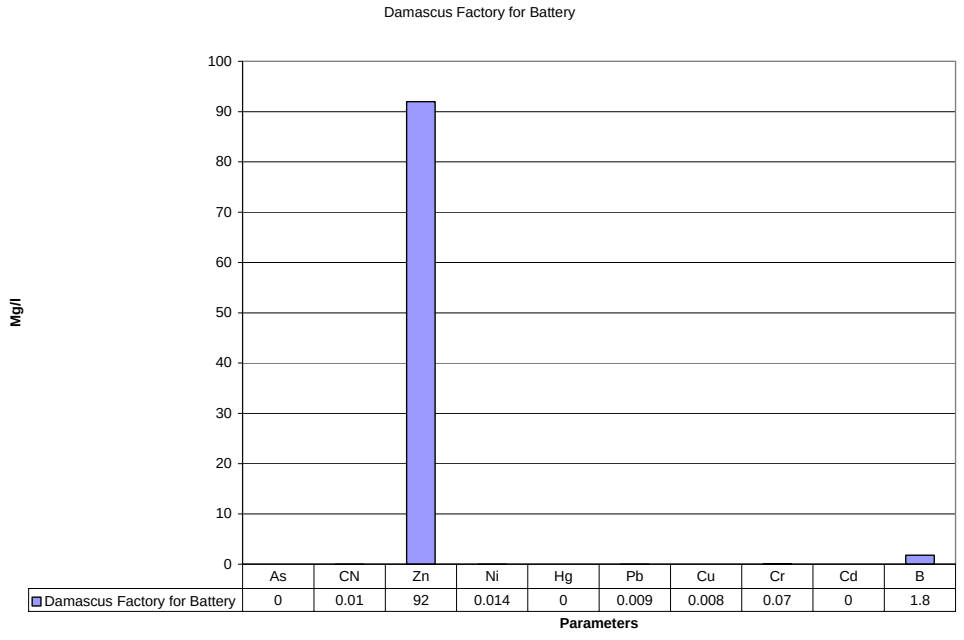
Water quality item			Standard	Unit	Battery
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

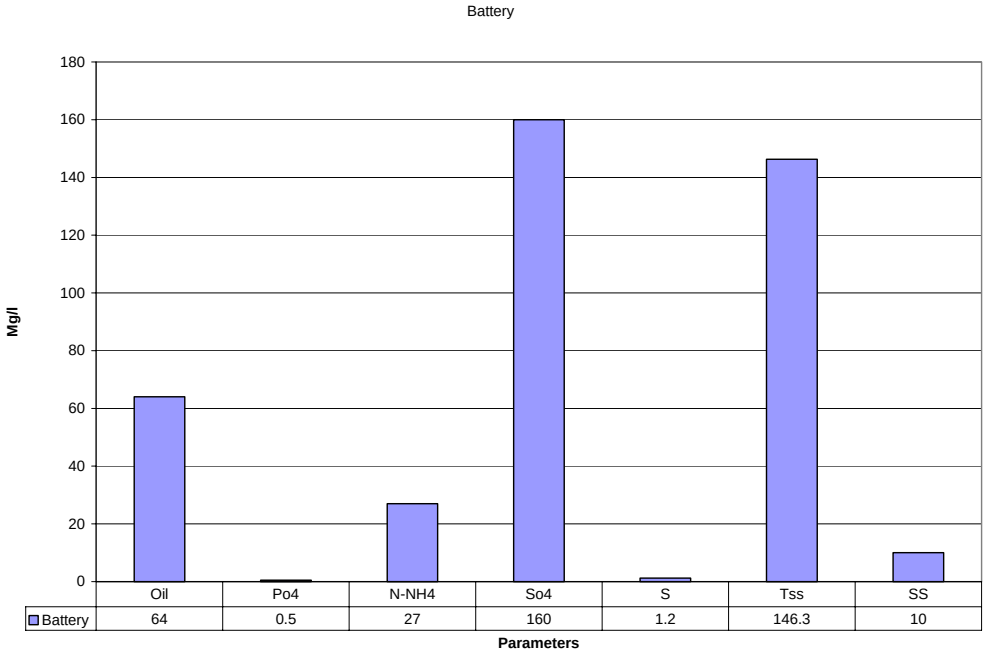
Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Battery

Factory Name																														
Parameter	F	Cl	TSS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Fe4	S-VOA	Sn4	F	Tin	Si	PH	F	Domestic Factory for Battery					
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	C°						
0.005	6	600	2000	1600	800	0.2	0.5	4	1	0.01	0	0.1	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.2	35						
	0.6	810	1124	2744	40	0	0.03	82	0.014	0	0.309	0.038	0.07	0	1.8	64	0.5	27	110	1.2	140.3	11	6.15	18						


Damascus Factory for Battery
3000
2500
2000
1500
1000
500
0
Mg/l
Cl
TDS
COD
BOD
Damascus Factory for Battery
850
1554
2744
40
Parameters


Damascus Factory for Battery
100
90
80
70
60
50
40
30
20
10
0
Mg/l
As
CN
Zn
Ni
Hg
Pb
Cu
Cr
Cd
B
Damascus Factory for Battery
0
0.01
92
0.014
0
0.009
0.008
0.07
0
1.8
Parameters


Battery
180
160
140
120
100
80
60
40
20
0
Mg/l
Oil
Po4
N-NH4
So4
S
Tss
SS
Battery
64
0.5
27
160
1.2
146.3
10
Parameters

(9) Fertilizer &Agricultural Chemicals factory

Company Name	Location	Sample
Sabag for chemicals	R Damascus	1
Sabag for Pesticide	R Damascus	1
Azot Fertilizer Factory	Homs	5

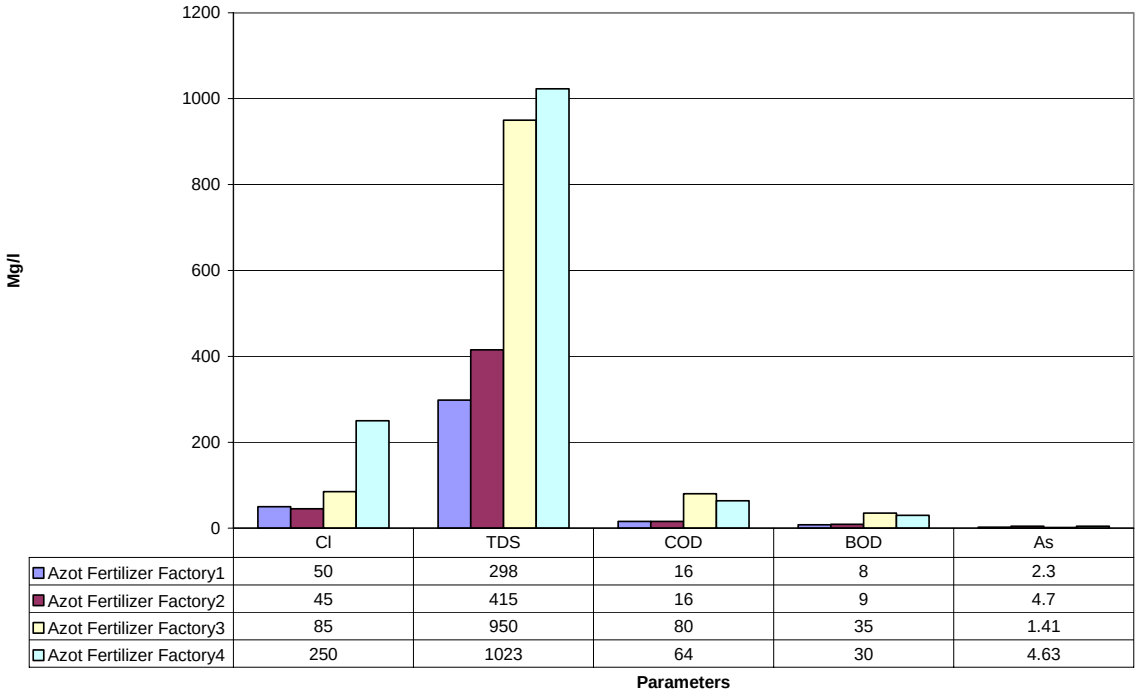
Water quality item			Standard	Unit	Fertilizer &Agricultural Chemicals
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Fertilizer & Agricultural Chemicals

Phenols	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Pot	N-NH4	So4	S	Tss	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1000	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.5	30	
	0	200	886	2980	500	0	0	0.8	0.14	0	0	0.203	0.02	0.01	1.7	0.01	18.5	71	200	0.8	138.6	20	6.99	13	Sabag for chemicals
	0	30	349	1170	40	0	0	0.001	0.09	0	0.0002	0.001	0	0.003	0	0.8	0.2	1.5	150	0.1	30	12	7.48	14	Sabag Company for Pesticide
	0.94	55	288	18	8	2.3	0.1	62.10^-3	93.10^-3	10.10^-3	<0.8	<0.8	3.10^-3	0.022	1.2	6	0.53	0.73	48	0.3	19	2	7.8	16.6	Azot Fertilizer Factory *Katinah*
	4.23	45	415	11	9	4.7	0.8	21.10^-3	85.10^-3	15.10^-3	<0.8	<0.8	40	21.10^-3	1.6	6	10.4	2.6	89	0.8	47	8	7.1	16.3	Azot Fertilizer Factory *Katinah*
	5.6	65	910	80	25	1.41	0.5	59	66	2.10^-3	<0.8	<0.8	14.10^-3	35.10^-3	1.2	0.6	1.25	73.8	425	0.4	128	15	6.18	32	Azot Fertilizer Factory *Assi River*
	8	250	1020	64	28	4.05	0.2	103	71	2.10^-3	<0.8	<0.8	54.10^-3	16.10^-3	0.8	0.2	5.8	94.1	125	0.1	74	12	8.8	24	Azot Fertilizer Factory *Assi River*
	10.8	45	630	24	12	4.60	0.3	91.10^-3	79.10^-3	5.10^-3	<0.8	<0.8	69.10^-3	25.10^-3	0.9	0.3	16	23.5	220	0.2	100	8	6.16	17	Azot Fertilizer Factory *Assi River*

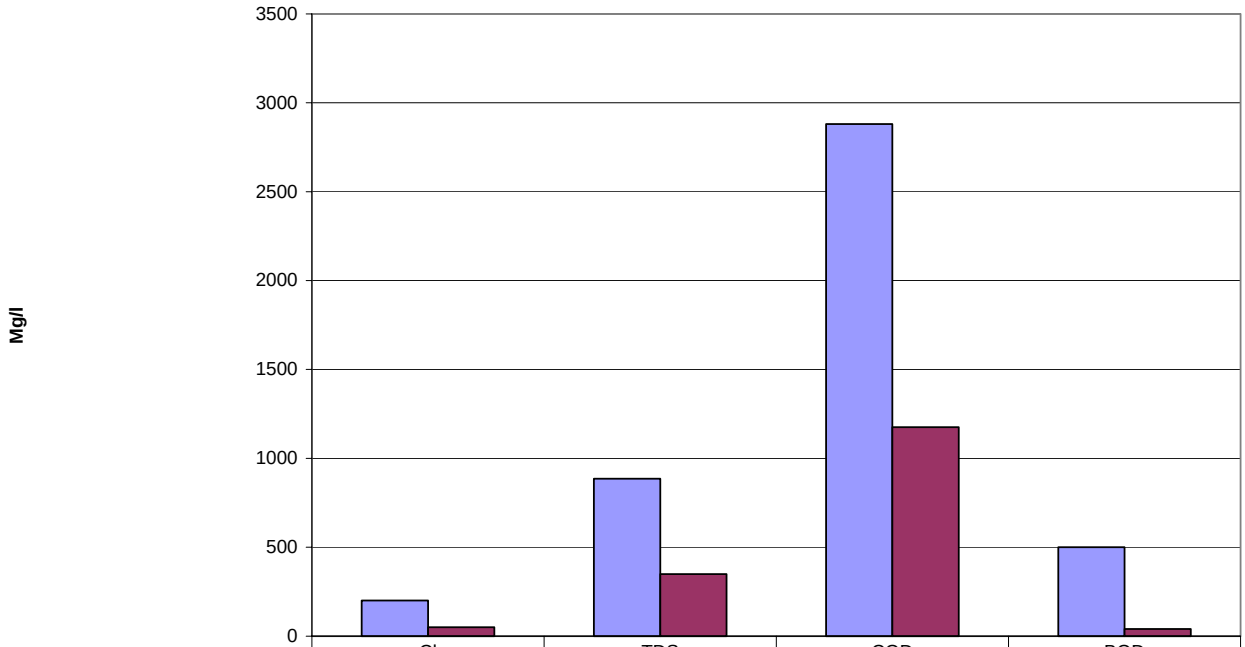
FERTILIZER



	Cl	TDS	COD	BOD	As
Azot Fertilizer Factory1	50	298	16	8	2.3
Azot Fertilizer Factory2	45	415	16	9	4.7
Azot Fertilizer Factory3	85	950	80	35	1.41
Azot Fertilizer Factory4	250	1023	64	30	4.63

Parameters

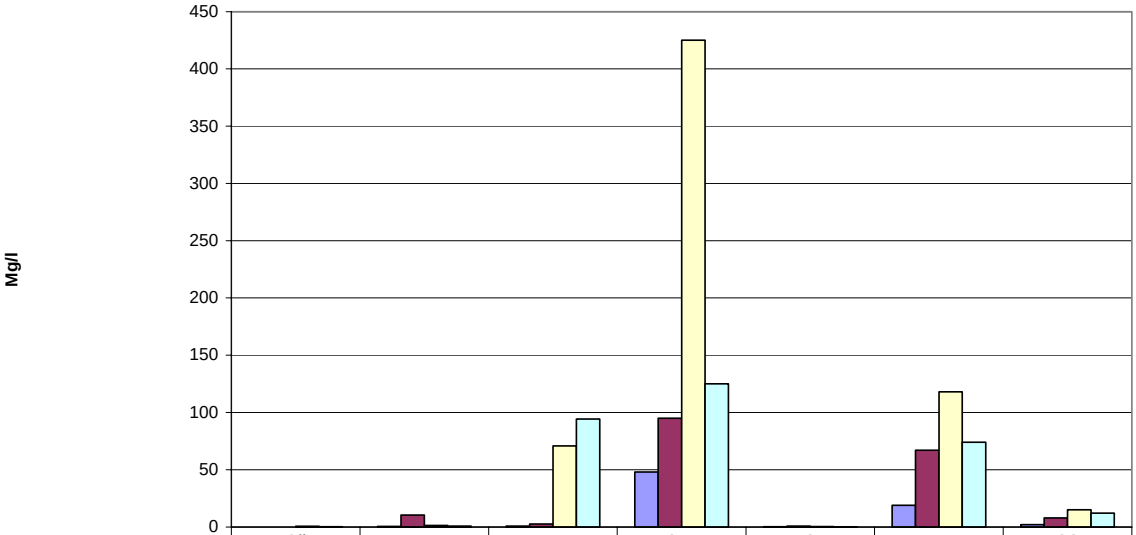
Chemicales & Pesticide



	Cl	TDS	COD	BOD
Sabag for chemicals	200	886	2880	500
Sabag Company for Pesticide	50	349	1176	40

Parameters

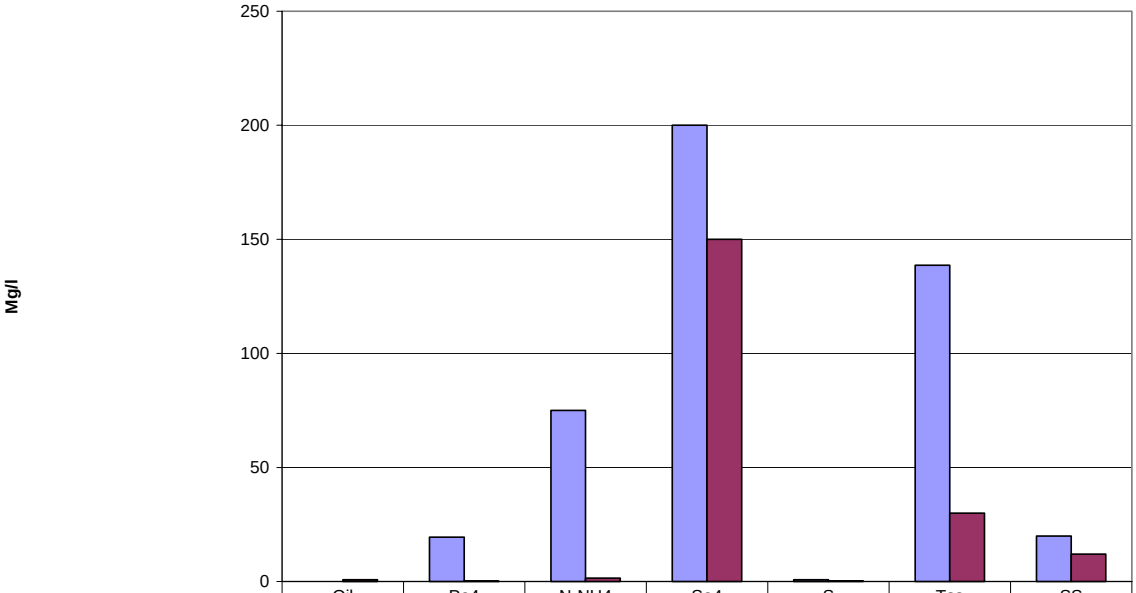
FERTILIZER



	Oil	Po4	N-NH4	So4	S	Tss	SS
Azot Fertilizer Factory1	0	0.53	0.73	48	0.3	19	2
Azot Fertilizer Factory2	0	10.4	2.6	95	0.8	67	8
Azot Fertilizer Factory3	0.6	1.25	70.8	425	0.4	118	15
Azot Fertilizer Factory4	0.2	0.8	94.3	125	0.1	74	12

Parameters

Chemicals & Pesticide



	Oil	Po4	N-NH4	So4	S	Tss	SS
Sabag for chemicals	0.01	19.5	75	200	0.8	138.6	20
Sabag Company for Pesticide	0.8	0.2	1.5	150	0.3	30	12

Parameters

(10) Soap / detergent factory:

Company Name	Location	Sample
Madar for Detergent	R Damascus	1
Al- Hayatt	R Damascus	1
General Co. For Chemical Detergents SAR	R Damascus	1
Hamdan and Ghaleb	R Damascus	1

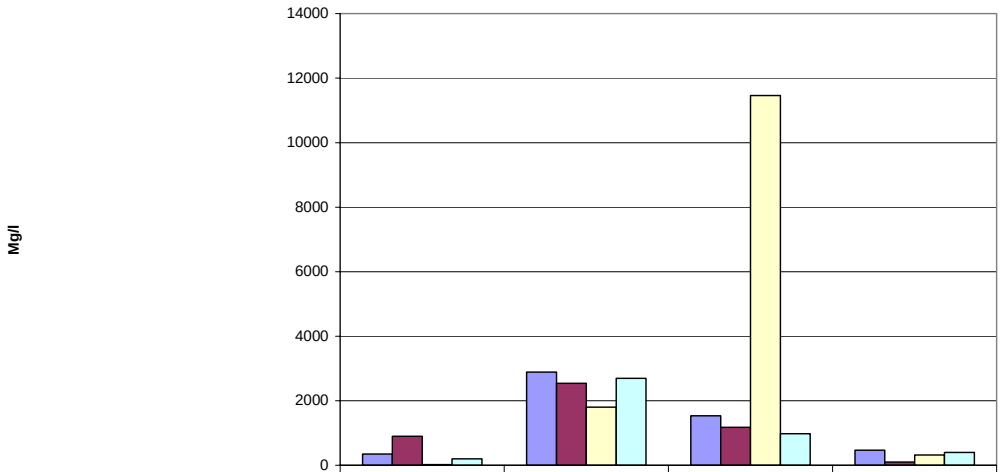
Water quality item			Standard	Unit	Soap / detergent
1	Temperature	T	35	℃	○
2	Hydrogen No.	pH	6.5–9.5	-	○
3	Precipitable Soil Materials	SS	10	mg/L	○
4	Total of Suspended Particles	TSS	500	mg/L	○
5	Sulfide	S	2	mg/L	○
6	Sulfate	SO_4	1,000	mg/L	○
7	Ammonia,/Ammonium	NH_4-N,NH_3-N	100	mg/L	○
8	Phospate	PO_4	20	mg/L	○
9	Saponifiable oils and grease and resinous materials	-	100	mg/L	○
10	Metallic oil and grease	-	10	mg/L	○
11	Boron	B	1.0	mg/L	○
12	Cadmium	Cd	0.1	mg/L	○
13	Cr^{6+}	Cr	0.1	mg/L	○
14	Calcic Chromium	Cr	2.0	mg/L	○
15	Copper	Cu	0.1	mg/L	○
16	Lead	Pb	0.1	mg/L	○
17	Mercury	Hg	0.01	mg/L	○
18	Nickel	Ni	2.0	mg/L	○
19	Selenium	Se	1.0	mg/L	○
20	Zinc	Zn	4.0	mg/L	○
21	Cyanide	CN	0.5	mg/L	○
22	Arsenic	As	0.1	mg/L	○
23	BOD	BOD	800	mg/L	○
24	COD	COD	1,600	mg/L	○
25	TDS	TDS	2,000	mg/L	○
26	Chloride	Cl	600	mg/L	○
27	Fluoride	F	8.0	mg/L	○
28	Pesticides	-	0.005	mg/L	
29	Algonac Organic Compounds	AOX	0.1	mg/L	
*	Barium	Ba	3.0	mg/L	*
*	Silver	Ag	1.0	mg/L	*
*	Phenol Compounds	-	2.0	mg/L	*
*	Detergents	ABS	5	mg/L	*

Note: "Standard" is the standards for industrial wastewater discharged into sewerage network,
○：Selected analysis water quality item
*: If analysis is possible in Syria, these items will be considered as additional analysis items

Factory Type: Soap / detergent

Pesticide	F	Cl	TDS	COD	BOD	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B	Oil	Po4	N-NH4	So4	S	Ts	SS	PH	T	Factory Name
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	c°	
0.005	8	600	2000	1600	800	0.1	0.5	4	2	0.01	0.1	0.1	0.1	0.1	1	10	20	100	100	2	500	10	6.5-9.5	45	
	1.1	350	2890	1316	470	0	0	0.016	0.11	0.019	0.002	0.017	0.7	0.006	0.1	0.2	400	13	650	0.6	183	30	8.5	34	Madar Company for Detergent
	0.5	900	2340	3176	300	0.022	0	0.018	0.07	0	0.001	0.004	0.001	0.007	0.5	0	9.1	4	300	0.3	15.5	71	7.06	14	Al- Hayatt
	1.1	20	1804	11460	220	0	0	0.23	0.1	3.46	0.003	0.006	0.05	0.0002	5.6	0.1	200	2.3	500	3.3	4373	13	10.2	11	General Co. For Chemical Detergents SAR
	0	330	2094	980	480	0.004	0	0.07	0.004	0.008	0	0.003	3	0.003	0.6	0	0.2	1.7	25	0.11	217	10	7.6	12	Hamdan and Ghaleb

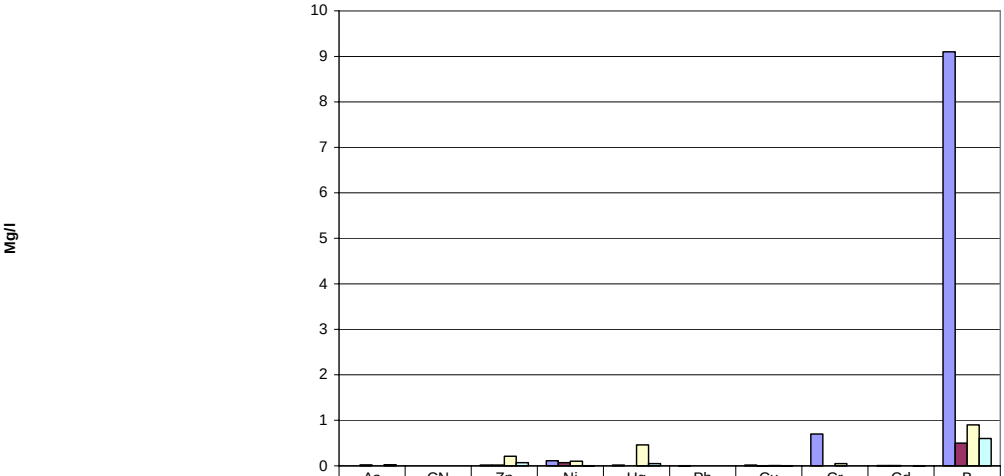
SOAP / DETERGENT



	Cl	TDS	COD	BOD
Madar Company for Detergent	350	2890	1536	470
Al- Hayatt	900	2540	1176	100
General Co. For Chemical Detergents SAR	20	1804	11460	320
Hamdan and Ghaleb	200	2694	980	400

Parameters

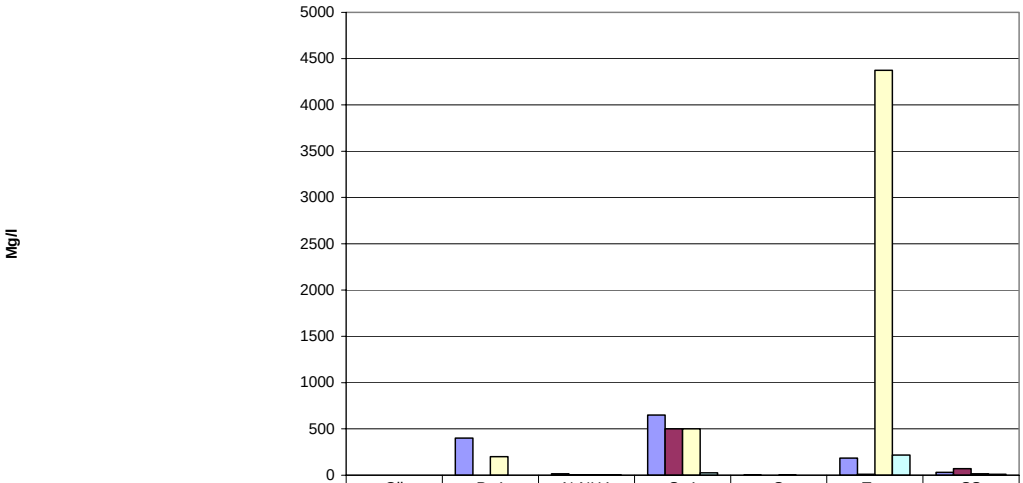
SOAP / DETERGENT



	As	CN	Zn	Ni	Hg	Pb	Cu	Cr	Cd	B
Madar Company for Detergent	0	0	0.016	0.11	0.019	0.002	0.017	0.7	0.006	9.1
Al- Hayatt	0.022	0	0.018	0.07	0	0.001	0.004	0.001	0.007	0.5
General Co. For Chemical Detergents SAR	0	0	0.21	0.1	0.46	0.001	0.006	0.05	0.0002	0.9
Hamdan and Ghaleb	0.024	0	0.07	0.004	0.048	0	0.002	0	0.003	0.6

Parameters

SOAP / DETERGENT



	Oil	Po4	N-NH4	So4	S	Tss	SS
Madar Company for Detergent	0.2	400	15	650	0.6	185	30
Al- Hayatt	0	0.1	4	500	0.3	10.5	71
General Co. For Chemical Detergents SAR	0.1	200	2.5	500	2.3	4373	15
Hamdan and Ghaleb	0	0.2	1.7	25	0.11	217	10

Parameters

1.3 Conclusion

The olive pressing sector in Syria consists of small olive processing factories. The factories are concentrated in the governorate where olive groves are located. The liquid waste of the olive pressing factories is a primary reason for groundwater pollution in these areas. The Directorate for Environmental Affaires in Lattakia reported that the liquid waste of the olive pressing factories is the reason for non-use of some surface water resources, like Difeh, a spring water source. The current solution for liquid waste problem of the olive oil pressing factories is to collect it in an open tank at the site and evaporate the liquid to dryness in drying beds. It is recommended in Law No. 50, that each olive factory construct a WWTP to treat their wastewater.

Under the current economic circumstances, it is not viable (economical) to establish a WWTP at each factory especially if the factory is very small. A strategy for marginal small olive pressing factories is to merge together in a single large cooperative olive processing factory with a single WWTP to solve the wastewater problem for the olive oil sector, thereby making it viable for all former small factories owners to remain in business.

The analytical results of the liquid waste analyses of the monitored olive oil pressing factory in Tartous and Darra are similar to all small olive processing factories, as can be seen in the Diagrams.

The wastewater quality for the two canning factories is similar except for COD and Tss, which are higher in concentration in the factory Al Rif than in canning factory in Darra.

Paper Factory Type

The analytical results of wastewater samples taken from the respective paper factories show a great variation between each others in the BOD, TDS, BOD The wastewater analyses from the Deir Ez Zor Paper Factory do not show a big variance from the required standard. The Deir Ez Zor Paper Factory has a WWTP, which recovers the cellulose and returns the material to the factory for reprocessing. The treated wastewater from this facility is discharged to a 3 km open channel that flows through the City of AlHusainieh to the Euphrates River.

Food Factory Type

Food Factories are an important industrial sector in Syria, it consist of many small factories, located in many cities and rural areas across the Country. The challenge it to control the process wastewater and its treatment to meet Law No. 50; and how WWTPs can be financed these small and/or old food factories.

A comparison between these food factory groups with respect to BOD and COD are illustrated in the Diagrams.

Other Type of Factory

This category includes several types of factories referred to as sub-types; i.e., the tannery

factory, the textile industry and others. Regarding the tannery factory the ministry of Housing and Constriction in cooperation with the Ministry of Local Administration and Environment has made a decision to use an Iranian grant to support moving 200 tannery factories in Damascus to rural areas outside of the City.

Tannery Factories:

Results of the wastewater analyses from the tannery factories are similar to each other; all having a big variation with the required standard. Diagrams show the analyses Results.

Textile Industries:

In general the sub-type textile industries are one of the highest polluting factory-types in the Country. The main environmental impacts generated by the cotton textile industry in Syria are: (1) aqueous effluents, (2) contaminated land, (3) waste generation, and (4) overuse of non-renewable resources. The primary overused resource is water. Textile production requires a huge amount of water for:

1. irrigation first,
2. the ginning, and
3. dyeing processes.

The impact on soil is high; its degradation is mainly due to overuse of pesticides and contaminated aqueous effluents. The stakeholders have an intellectual grasp of the environmental impacts of the Syrian textile industry. However, the impact of their activities and the subsequent environmental degradation is not recognized as to its full impact. Furthermore, the legal framework, as well as its enforcement, does not provide enough incentives and/or constraints for mitigating those impacts.

Not only is Damascus and Damasks rural soil and groundwater impacted (polluted) by the textile industries; but also Deir Ez Zor is impacted from the textile factory wastewater being discharged to the open land.

Diagrams show the analytical results of the monitored Factories, in which the high value of the COD and TDS are to be seen.

Many of the monitored factories are located in the areas of Hoshbals and Shnaiah; these factories use water well and discharge their wastewater to an open channel that flows through populated areas and agricultural areas. The incorrect dimension of the channel and an insufficient sewerage net, results in a high water level in the wastewater channel which harm the inhabitants surrounding the channel and polluted the agriculture lands of the area.

Chemicals (pharmaceutical) factories:

The monitored Chemicals (pharmaceutical) factories: are similar to all small pharmaceutical factories, as can be seen in the Diagrams except for COD and, which are higher in concentration in the factory Tamico

Soap/Detergent factories:
The analytical results of wastewater samples taken from the respective Soap/Detergent factories show a great variation between each others in the BOD, TDS, BOD The wastewater analyses are illustrated in the Diagrams.

In general most of the monitored factories having a big variation in the COD, TSD with the required standard, other Factories having a variation in the tress element with the required standard, especially the Oil refinery factory and Electroplating/Coating and Tannery having a big variation in Ni, Cu and Cr.. Etc. . The reasons for this variation with the Standard are: (i) ineffective production management system and insufficient of the chemical within the production chain, (ii) the absence of waste water treatment plant.

Appendix 2

Domestic Wastewater Quality Survey

1.1 Technical Specifications

1.1.1 General Specification

The JICA Study Team (herein after "the Study Team") headed by Hirofumi Sano has been dispatched by Japan International Cooperation Agency (JICA) to the Syrian Arab Republic to conduct the Study on Sewerage System Development (herein after "the Study") for improving the water quality of public water body. The Study is intended to formulate the Master Plan for the designated areas of seven governorates, and carry out a feasibility study with a focus on one area.

Under the Study, data for basic inputs e.g., wastewater quality and flow conditions need to be generated. This work is proposed to be sub-contracted to a local agency (herein after 'The Contractor') which has the required expertise and infrastructure facilities. This document provides the Technical Specifications for the proposed work. The key aspects are listed below:

a. Sewage discharge: sampling and analysis of discharged waste water at the two (2) sewage discharges in the two (2) cities/towns.
b. Measurement of flow rates and survey of flow sections, at the two (2) sewage discharges in the two (2) cities/towns.

5.1.2 Scope of Work

Sampling, water quality analysis and flow measurement will be conducted to figure out the present wastewater condition in the two discharges.

(1) Survey Location and Number

The samples of wastewater shall be collected at discharge point at city/town. The approximate location, the number of samples to be collected, and the number of flow measurements are as shown in **Table 1**. Exact locations will be instructed by the Study Team during the filed work.

Table 1 Survey Locations and Number

City	Location of Discharge	Number of Discharge	Working Hours (hr)	Number of Sampling	Number of Analysis	Number of Flow Measurement
Mayadeen	Euphrates River	1	9	4	4	10
Banias	Coast of city center	1	9	4	1 *1	10
Total		2		8	5	20

*1: Water quality analysis for the Banias shall be conducted by four composite samples.

(2) Method of Sampling

- For the case of Mayadeen City

  Independent samples at one (1) discharge shall be collected every 3 hours, totally nine (9) times on a survey, staring at 9：30 am until 6:30 pm for 9 hrs.

Number of Times	Sampling Time
1	9:30
2	12:30
3	15:30
4	18:30

- For the case of Banias

  Composite sample at one (1) discharge shall be collected every 3 hours, four (4) times on survey, staring at 9：30 am until 6:30 pm for 9 hrs.

number of times	Sampling time
1	9:30
2	12:30
3	15:30
4	18:30

- Sampling shall be done by the Contactor during a fine weather day, at least three days after rainy day.

(3) Water Quality Parameters of Interest

The water quality parameters to be analyzed are listed below in Table 2.

Table 2 Water Quality Parameters to be Analysis

Physical	Temperature, SS
Chemical	BOD_5, CODcr, T-N, T-P
Biological	Total Coliform

The samples shall be collected, transferred and preserved as per the procedure recommended for each specific parameter under relevant sections of “Standard Methods for the Examination of Wastewater” published by APHA (American Public Health Association), or AWWA (American Water Works Association) or equivalent. The Contractor shall make complete arrangements for provision of necessary reagents, equipment, instruments etc. No deviation from standard practice shall be entertained. If it is found otherwise, the Contractor shall be liable to carry out fresh sampling/analysis at his own cost.

Regarding to the water analysis for Banias, sewage quality analysis shall be conducted by the composite sample of four samplings.

(4) Flow Measurement

- For the case of Mayadeen city

  The flow at one (1) discharge shall be measured every hour, totally ten (10) times on a survey, starting at 9:30 am, until 6:30 pm.

- For the case of Banias

  The flow at one (1) discharge shall be measured every hour, ten (10) times on a survey, starting at 9:30, until 6:30 pm.

The flow shall be measured by the method using electromagnetic flow meter, if flow meter is not available, measured by installing an appropriate weir in the respective channels.

(5) Condition of Work

Sampling, analysis and flow measurement shall be done by the Contractor. All the equipment required for the survey shall be provided by the Contractor.

(6) Reports and Data to be submitted

Before initiating the field survey, the Contractor shall submit a survey plan including schedule of sampling, list of equipment, reporting and deployment of engineers/chemists and supporting staff to the site.

The Contractor shall submit three (3) copies of the Report. The report shall include, but not limited to, the following:

1) Report including results of water quality analyses and flow measurements
2) Description of the conditions at the time of sampling and justification for any abnormally high or low values
3) Digital data (MS Excel format data of analyzed results)
4) Backup data especially pertaining to sampling time, place and date, analysis and flow measurement methods; and
5) Photographs of sampling in the fields and analyses in laboratory.

It shall be noted that the quality of the measured data is of paramount concern and therefore, the Contractor shall pay special attention to quality assurance of the reports and data that will be submitted to the Study Team and shall provide explanation for observed discrepancies, if any.

(7) Time Schedule

The Services shall be commenced on 10th June, 2007 as per the following schedule given in Table 3, and shall be completed within forty (40) days, i.e. by 19th July. The first round of sampling and analysis shall be completed by 20th June, and reported on 21st June as the Progress Report.

Table 3 Schedule of Sampling

Items	May, 2007	Jun, 2007	July, 2007
Commencement of works		△	
1st Sampling and flow measurement at Mayadeen		▮	
Water quality analysis And Reporting		▬	
Submission of Progress Report		▲	
2nd Sampling and flow measurement at Banias		▮	
Water quality analysis And Reporting		▬	
Submission of Draft Report		▲	
Submission of Final Report		▲	

1.1.3 Contract Price

(1) Total Price of Agreement

Total Price = 4,500 US$

(2) Costs to be included in the Agreement Price

- Costs for mobilization, demobilization, per diem allowance for the survey team and others required for execution of the survey are included in each sub-item.
- Any taxes and charges are included in the agreement price.

1.2 Summary of the Result of Survey

1.2.1 Mayadin

(1) Water Quality Analysis

City	No. of Discharge	No. of Sampling and Analysis	No. of Flow Measurement
Mayadin	1	4	10

Parameter		Unit	Sampling Time			
			09:30	12:30	15:30	18:30
Physical	Temperature	°C	27.1	28.3	29.1	27.7
	SS	mg/l	585	562	530	455
Chemical	BOD	mg/l	297	285	234	333
	COD	mg/l	433.13	314.5	255.13	373.8
	T-N	mg/l	60	44	40	44
	T-P	mg/l	3.0	3.8	3.5	3.0
Physical	Total Colif.	unit/100ml	3.10^6	15.10^6	18.10^6	120.10^6

(2) Flow Measurement

Flow Measurement (m^3/day)									
09:30	10:30	11:30	12:30	13:30	14:30	15:30	16:30	17:30	18:30
2,148	2,148	3,207	4,096	6,334	6,334	7,279	7,650	8,772	6,992

1.2.2 Banias

(1) Water Quality Analysis

City	No. of Discharge	No. of Sampling	No. of Analysis	No. of Flow Measurement
Banias	1	4	1	10

Parameter		Unit	Result
Physical	Temperature	°C	23
	SS	mg/l	125
Chemical	BOD	mg/l	206
	COD	mg/l	400
	T-N	mg/l	45
	T-P	mg/l	6.5
Physical	Total Colif.	unit/100ml	3.10^6

(2) Flow Measurement

Flow Measurement (m^3/day)									
09:30	10:30	11:30	12:30	13:30	14:30	15:30	16:30	17:30	18:30
1,555.2	1,667.5	1,771.2	2,004.4	2,160.0	2,073.6	1,987.2	2,246.4	2,246.4	2,246.4

Appendix 3

Social Survey

1.1 Technical Specifications

1.1.1 General Specification

This specification is prepared to implement the Social Survey for the Project of "The Study on Sewerage System Development in the Syrian Arab Republic" (hereinafter referred to as 'the Work'). The Work should be executed and completed under the supervision of the Environmental Impacts Assessment and Social Relations Questionnaire Survey Expert in accordance with the specifications presented hereunder.

The Work generally consists of the following tasks.

1) Finalization of the questionnaires based on questionnaires prepared by the JICA Study Team
2) Selection of target area and interviewees
3) Training of interviewers and preliminary survey
4) Questionnaire survey
5) General statistical analysis of the survey results
6) Preparation of survey report

(1) Objectives

The main objective of the Work is to collect information and data useful for understanding the actual condition of sanitation, public awareness and Willingness-to-pay for sewerage tariff and irrigation tariff.

(2) Survey Area

The survey area will cover: (a) Zabadani, (b) Bludan, (c) Buqqein and Madaya, (d) downstream of Barada River in Rural Damascus Governorate. For each area, contractor is requested to collect an answer from the following number of respondent, at least or above of the following table.

Table 1 Minimum Number of Sample Size to be Collected at the Survey

Area	Number of Respondent	Remarks
Zabadani	97	
Bludan	11	
Buqqein and Madaya	41	
Downstream of Barada River	50	The interviewees should be the farmers who have the farmland.
Total	200	

1.1.2 Technical Specifications

The survey shall be made by questionnaires to targeting inhabitants in Zabadani area. The total number of questionnaires to be collected shall be at least 200.

The survey shall be carried out by direct interview using a questionnaire to be filled out by the interviewers. In order to optimize the survey, a few preliminary surveys shall be carried out before carrying out the full survey.

The main survey items are shown in **Table 1**.

Table 1 Major items of questionnaire

Content	Item
1. General information of interviewees	Address, name, gender, age, the number of family members, occupation, education level, duration dwelling
2. Social-economic characteristics of interviewees	Housing ownership, average monthly income and expenditure of the household, breakdown of expenditure
3. General information of water supply	Water source, monthly water consumption, opinion on water tariff
4. General information of sewerage system	Destination of sewage, method of sewerage tariff payment, willingness-to-pay for sewerage tariff etc.
5. General information of health and hygiene	Situation of water-borne diseases etc.
6. General level of understanding on the environment	Attitude of environment issues and major pollution sources etc.
7. General information on irrigation and willingness-to-pay for irrigation tariff	Current situation of irrigation for farmland, willingness of irrigation tariff for using treated sewage etc.

Collected data and information shall be sorted using Microsoft Excel or equivalent, and analyzed for each questionnaire item.

1.1.3 Team Building for the Survey

The Contractor shall organize some survey teams according to the schedule and area of the survey as well as the number of questionnaires. Each survey team shall be comprised of one team leader and adequate number of supporting staffs in order to complete the Work within the period specified. Female surveyor should be included in the team, in order to obtain an answer from female respondent. The team leader is required to have a background in environmental and social issues and good communication skill to carry out the above-mentioned tasks.

1.1.4 Time Frame

The Work shall be finished within 30 days from the contract date. The Work schedule is presented in **Table 2**.

Table 2 Time schedule of the survey

Work Items	Days			
	Week 1	Week 2	Week 3	Week 4
Preparation of the Work	■			
Preliminary Survey	■			
Questionnaire Survey		■	■	
Reporting	▲ IC/R		▲ DF/R	▲ F/R

IC/R: Inception Report, DF/R: Draft Final Report, F/R: Final Report

1.1.5 Deliverables

The following deliverables of the Work shall be submitted to the JICA Study Team according to the schedules designated above. Information and data sources refereed for the Work shall be clearly described in the reports.

(1) Inception Report

Inception report describing the approach, methodology, team mobilization plan, and schedule to be applied to the Work shall be submitted to the JICA Study Team within one (1) week after signing of the contract. The questionnaire forms to be used in the field survey shall be annexed to the report. Principally the surveys shall be conducted based on this specifications prepared by the JICA Study Team. However, the Contractor shall propose additional and/or revised survey items and methodologies to the JICA Study Team from local expert's viewpoints and discuss with the JICA Study Team on a survey plan to be prepared in the Inception Report prior to commencement of the Survey.

(2) Draft Final Report

Draft final report shall be submitted to the JICA Study Team, two (2) weeks before the termination of the contract..

(3) Final Report

The final report shall be submitted to the JICA Study Team until the termination of the contract. The report shall be prepared through corrections, additions, and subtractions based on the comments issued in the meeting and discussions with the JICA Study Team for the draft final report.

(4) Number of submissions

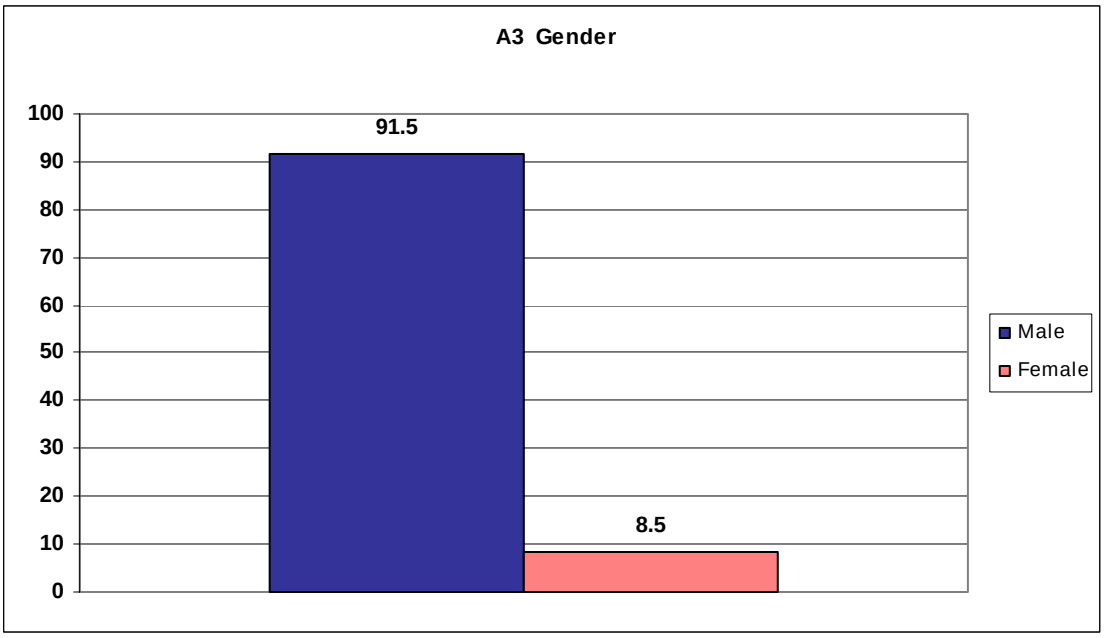
1) Two (2) sets of Inception Report in English.
2) Two (2) sets of Draft Final Report in English.
3) Three (3) sets of Final Report in English with one (1) set of CD-ROM including the full contents of Final Report applying a mutually agreed software.
4) All the documents and data collected during the Work with a list.
5) Photos (taken by digital camera) showing field survey situation.

1.2 Summary of the Results of Survey

A. Questions on general information of the household

A3 Gender

	No	%
Male	193	91.5
Female	18	8.5
Total	211	100.0

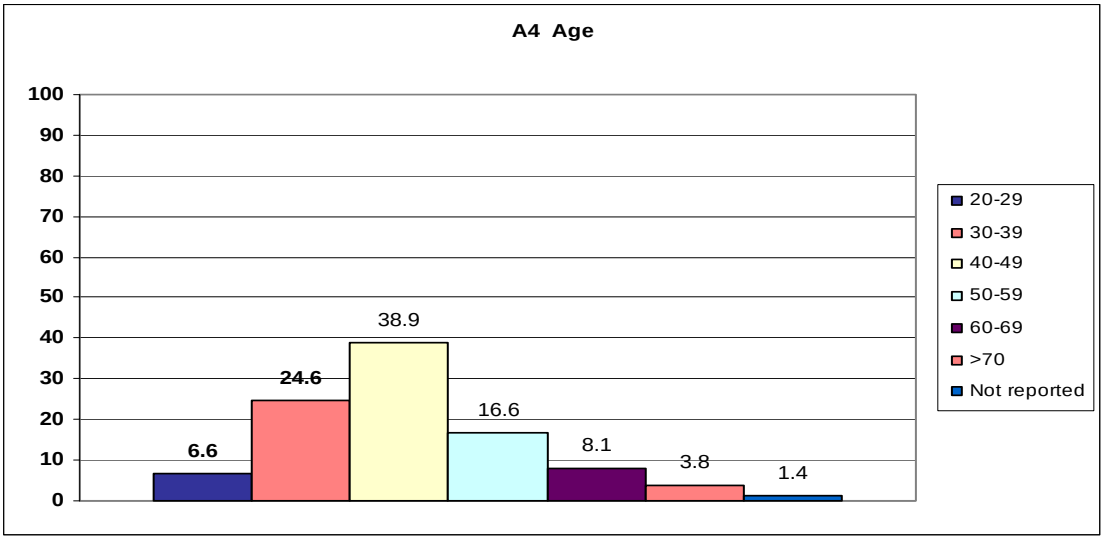


A3 Gender

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Male	92	91.1	11	73.3	43	95.6	47	94.0	193	91.5
Female	9	8.9	4	26.7	2	4.4	3	6.0	18	8.5
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

A4 Age

	No	%
20-29	14	6.6
30-39	52	24.6
40-49	82	38.9
50-59	35	16.6
60-69	17	8.1
>70	8	3.8
Not reported	3	1.4
Total	211	100.0

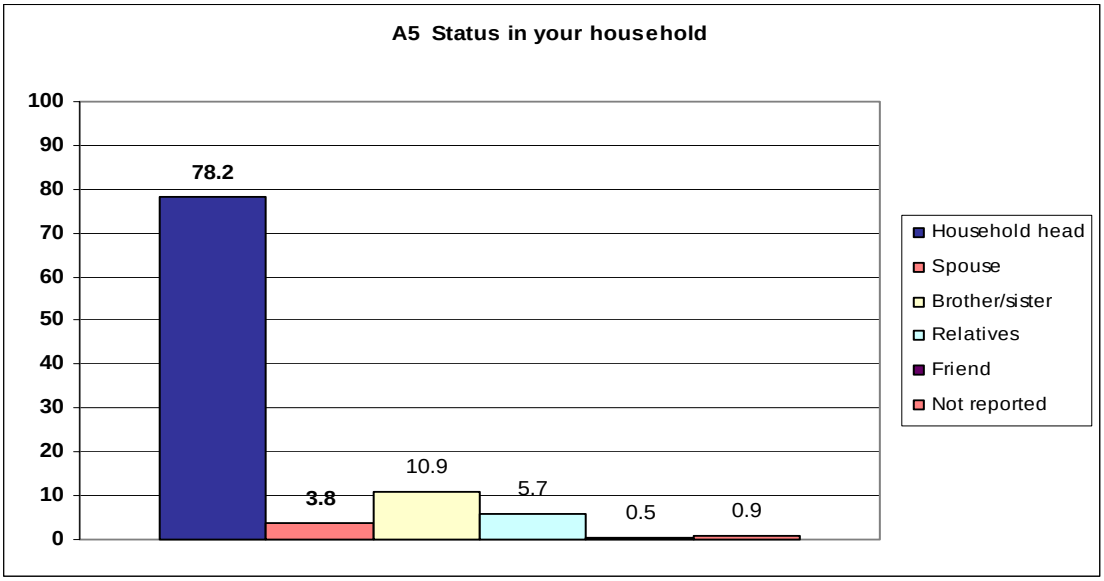


A4 Age

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
20-29	9	8.9	2	13.3	3	6.7			14	6.6
30-39	35	34.7	3	20.0	8	17.8	6	12.0	52	24.6
40-49	39	38.6	6	40.0	21	46.7	16	32.0	82	38.9
50-59	10	9.9	3	20.0	9	20.0	13	26.0	35	16.6
60-69	6	5.9			2	4.4	9	18.0	17	8.1
>70					2	4.4	6	12.0	8	3.8
Not reported	2	2.0	1	6.7					3	1.4
Total	101	100	15	100	45	100	50	100	211	100

A5 Status in your household

	No	%
Household head	165	78.2
Spouse	8	3.8
Brother/sister	23	10.9
Relatives	12	5.7
Friend	1	0.5
Not reported	2	0.9
Total	211	100.0



A5 Status in your household

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Household head	78	77.2	11	73.3	38	84.4	38	76.0	165	78.2
Spouse	4	4.0	1	6.7			3	6.0	8	3.8
Brother/sister	17	16.8	2	13.3	3	6.7	1	2.0	23	10.9
Relatives	2	2.0	1	6.7	4	8.9	5	10.0	12	5.7
Friend							1	2.0	1	0.5
Not reported							2	4.0	2	0.9
Total	101	100	15	100	45	100	50	100	211	100

Descriptive Statistics

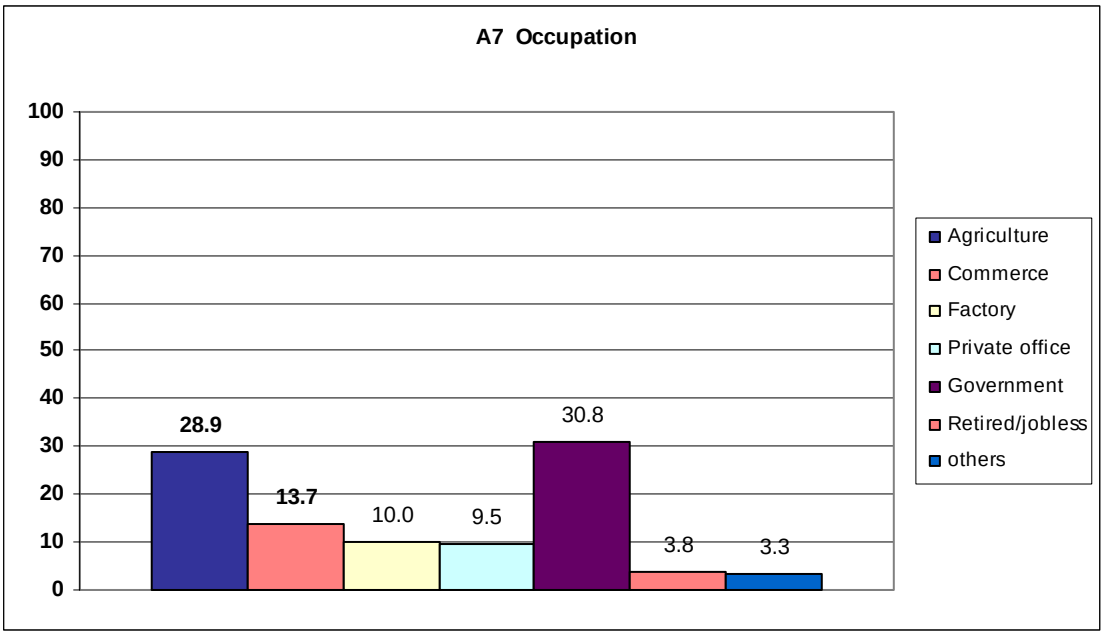
	N	Mean	Std. Deviation
Number of family members in your household	203	5.52	2.833

A6_4 Number of family members in your household

		N	Mean	Std. Deviation
Area	Zabadani	96	5.2	2.8
	Bludan	15	6.4	4.1
	Buqqein & Madaya	42	5.4	1.6
	Downstream of barada river	50	5.9	3.2
	Total	203	5.5	2.8

A7 Occupation

	No	%
Agriculture	61	28.9
Commerce	29	13.7
Factory	21	10.0
Private office	20	9.5
Government	65	30.8
Retired/jobless	8	3.8
others	7	3.3
Total	211	100.0

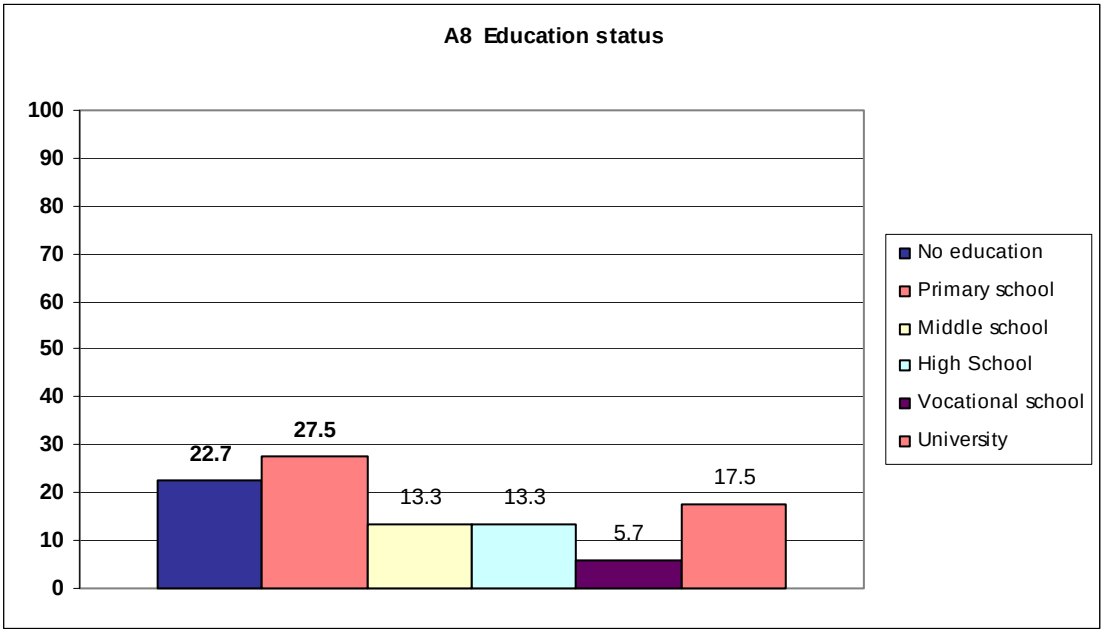


A7 Occupation

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Agriculture	8	7.9	2	13.3	11	24.4	40	80.0	61	28.9
Commerce	13	12.9	3	20.0	7	15.6	6	12.0	29	13.7
Factory	9	8.9			8	17.8	4	8.0	21	10.0
Private office	11	10.9	1	6.7	8	17.8			20	9.5
Government	47	46.5	9	60.0	9	20.0			65	30.8
Retired/jobless	7	6.9			1	2.2			8	3.8
others	6	5.9			1	2.2			7	3.3
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

A8 Education status

	No	%
No education	48	22.7
Primary school	58	27.5
Middle school	28	13.3
High School	28	13.3
Vocational school	12	5.7
University	37	17.5
Total	211	100.0

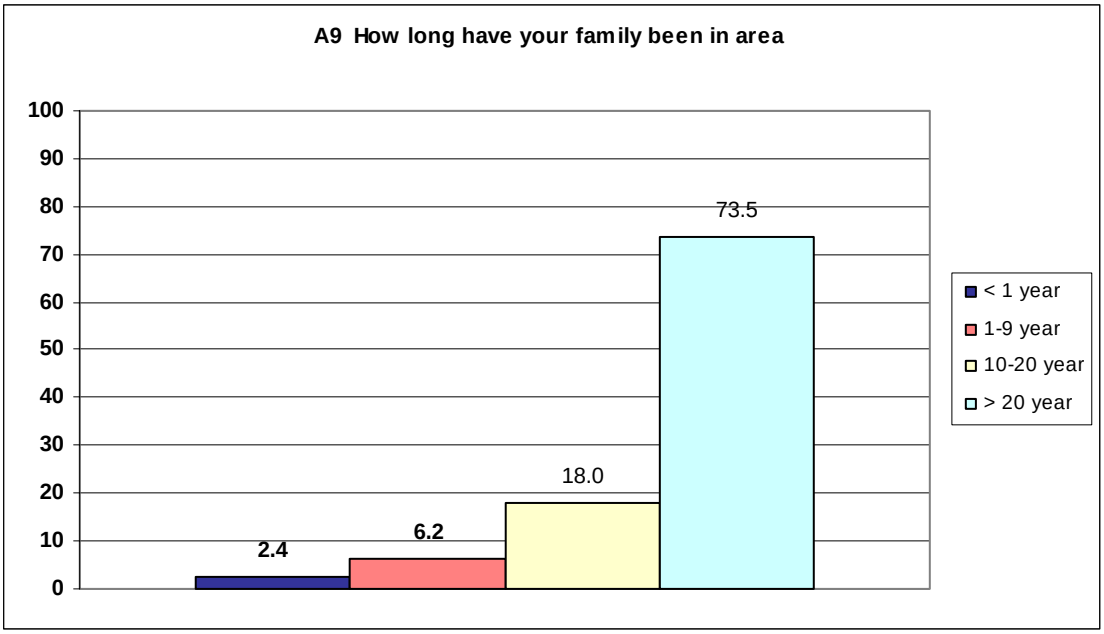


A8 Education status

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
No education	13	12.9	1	6.7	15	33.3	19	38.0	48	22.7
Primary school	33	32.7			10	22.2	15	30.0	58	27.5
Middle school	19	18.8			5	11.1	4	8.0	28	13.3
High School	14	13.9	3	20.0	5	11.1	6	12.0	28	13.3
Vocational school	6	5.9	2	13.3	2	4.4	2	4.0	12	5.7
University	16	15.8	9	60.0	8	17.8	4	8.0	37	17.5
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

A9 How long have your family been in area

	No	%
< 1 year	5	2.4
1-9 year	13	6.2
10-20 year	38	18.0
> 20 year	155	73.5
Total	211	100.0



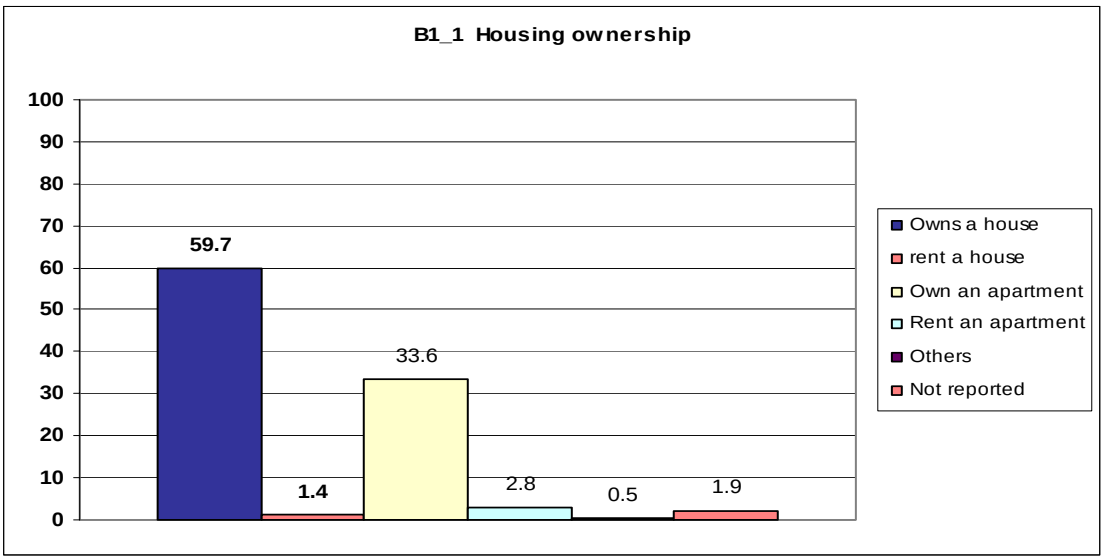
A9 How long have your family been in area

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
< 1 year	4	4.0					1	2.0	5	2.4
1-9 year	6	5.9			1	2.2	6	12.0	13	6.2
10-20 year	26	25.7	2	13.3	5	11.1	5	10.0	38	18.0
> 20 year	65	64.4	13	86.7	39	86.7	38	76.0	155	73.5
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

B. Questions on Socio-economic characteristics of household

B1_1 Housing ownership

	No	%
Owns a house	126	59.7
rent a house	3	1.4
Own an apartment	71	33.6
Rent an apartment	6	2.8
Others	1	0.5
Not reported	4	1.9
Total	211	100.0



B1_1 Housing ownership

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Owns a house	49	48.5	7	46.7	21	46.7	49	98.0	126	59.7
rent a house	3	3.0							3	1.4
Own an apartment	40	39.6	8	53.3	23	51.1			71	33.6
Rent an apartment	6	5.9							6	2.8
Others	1	1.0							1	0.5
Not reported	2	2.0			1	2.2	1	2.0	4	1.9
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

B1_2 Rent of house SP/month

		N	Mean	Std. Deviation
Housing ownership	rent a house	3	3666.7	577.4
	Rent an apartment	6	2883.3	1273.4
	Total	9	3144.4	1118.2

B1_2 Rent of house SP/month

				N	Mean	Std. Deviation
Area	Zabadani	Housing ownership	rent a house	3	3666.7	577.4
			Rent an apartment	6	2883.3	1273.4
			Total	9	3144.4	1118.2
	Total	Housing ownership	rent a house	3	3666.7	577.4
			Rent an apartment	6	2883.3	1273.4
			Total	9	3144.4	1118.2

B2 Average monthly income of the household SP/month

		N	Mean	Std. Deviation
Area	Zabadani	101	19236.6	15180.7
	Bludan	15	30893.3	26422.4
	Buqqein & Madaya	45	29066.7	23542.7
	Downstream of barada river	49	22510.2	20626.8
	Total	210	22939.5	19766.7

B3 Average monthly expenditure of the household SP/month

		N	Mean	Std. Deviation
Area	Zabadani	100	18265.0	12005.1
	Bludan	15	29560.0	25047.2
	Buqqein & Madaya	44	45568.2	132843.8
	Downstream of barada river	44	19954.5	15630.8
	Total	203	25383.7	63594.9

B4 Average amount spent on each item per month

			Average amount spent on Water tariff	Average amount spent on Sewerage tariff	Average amount spent on Electricity tariff	Average amount spent on Food tariff	Average amount spent on Sold waste collection tariff	Average amount spent on Gas tariff	Average amount spent on Telecommunication tariff	Average amount spent on Cigarette tariff
Area	Zabadani	N	93.0	2.0	99.0	100.0	7.0	99.0	98.0	43.0
		Mean	372.3	50.0	842.4	9900.0	50.0	423.5	900.0	1323.3
		Std. Deviation	297.3	0.0	618.9	6590.1	0.0	243.9	846.8	668.3
	Bludan	N	14.0		15.0	15.0		14.0	15.0	6.0
		Mean	689.3		1200.0	16300.0		439.3	1073.3	5366.7
		Std. Deviation	979.0		747.1	14199.8		197.3	743.3	9637.8
	Buqqein & Madaya	N	45.0		43.0	43.0		42.0	42.0	26.0
		Mean	342.2		1494.2	12902.3		366.7	854.8	1511.5
		Std. Deviation	197.1		3040.9	8892.9		184.3	657.1	692.4
	Downstream of barada river	N	42.0		48.0	48.0		45.0	47.0	19.0
		Mean	307.1		1264.6	13114.6		356.7	627.7	1278.9
		Std. Deviation	749.8		1670.7	8694.1		133.8	391.0	533.9
	Total	N	194.0	2.0	205.0	206.0	7.0	200.0	202.0	94.0

		Mean	374.1	50.0	1104.1	11741.7	50.0	397.6	840.1	1624.5
		Std. Deviation	493.4	0.0	1685.6	8495.6	0.0	209.4	723.9	2520.5

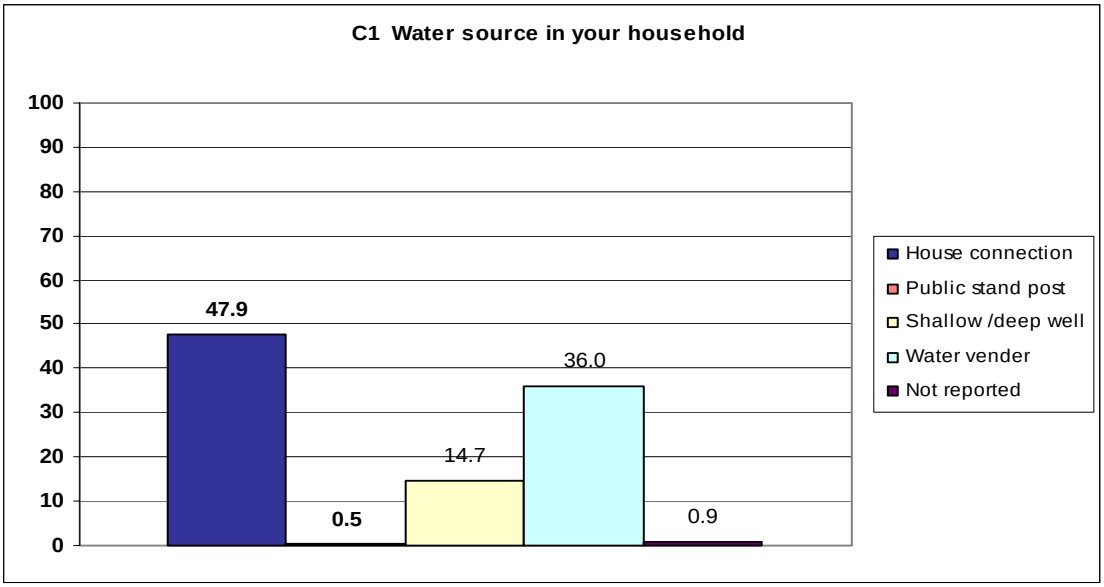
Descriptive Statistics

	N	Mean	Std. Deviation
Average monthly income of the household SP/month	210	22939.5	19766.7
Average monthly expenditure of the household SP/month	203	25383.7	63594.9
Average amount spent on Water tariff	194	374.1	493.4
Average amount spent on Sewerage tariff	2	50.0	0.0
Average amount spent on Electricity tariff	205	1104.1	1685.6
Average amount spent on Food tariff	206	11741.7	8495.6
Average amount spent on Sold waste collection tariff	7	50.0	0.0
Average amount spent on Gas tariff	200	397.6	209.4
Average amount spent on Telecommunication tariff	202	840.1	723.9
Average amount spent on Cigarette tariff	94	1624.5	2520.5

C. Questions on general information of water supply

C1 Water source in your household

	No	%
House connection	101	47.9
Public stand post	1	0.5
Shallow /deep well	31	14.7
Water vender	76	36.0
Not reported	2	0.9
Total	211	100.0



C1 Water source in your household

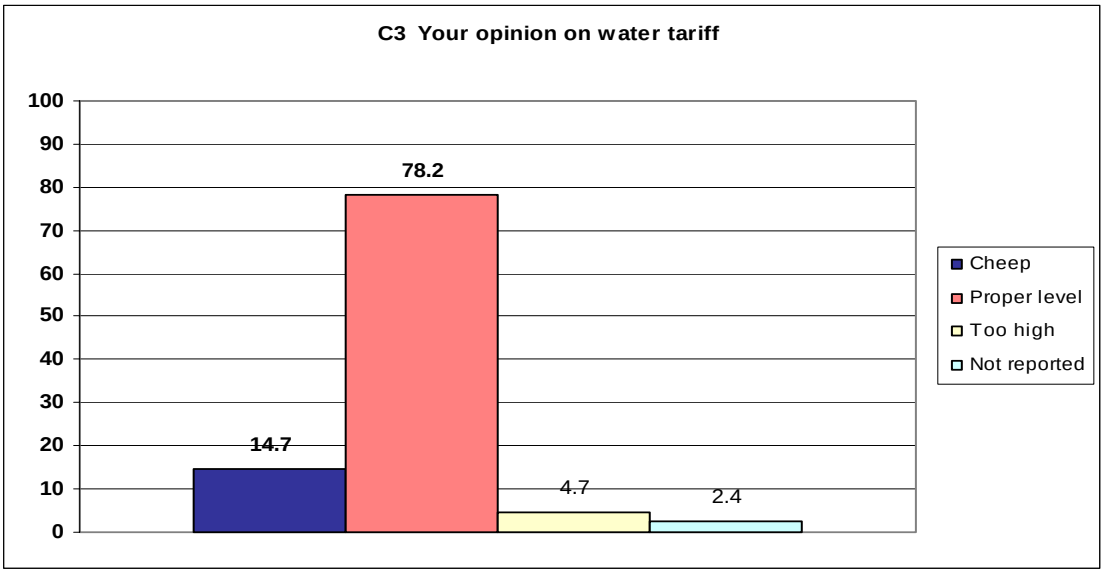
	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
House connection	65	64.4	9	60.0	26	57.8	1	2.0	101	47.9
Public stand post							1	2.0	1	0.5
Shallow /deep well							31	62.0	31	14.7
Water vender	35	34.7	6	40.0	19	42.2	16	32.0	76	36.0
Not reported	1	1.0					1	2.0	2	0.9
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

Descriptive Statistics

	N	Mean	Std. Deviation
Monthly water consumption in your household	206	200.2	2436.5

C3 Your opinion on water tariff

	No	%
Cheep	31	14.7
Proper level	165	78.2
Too high	10	4.7
Not reported	5	2.4
Total	211	100.0



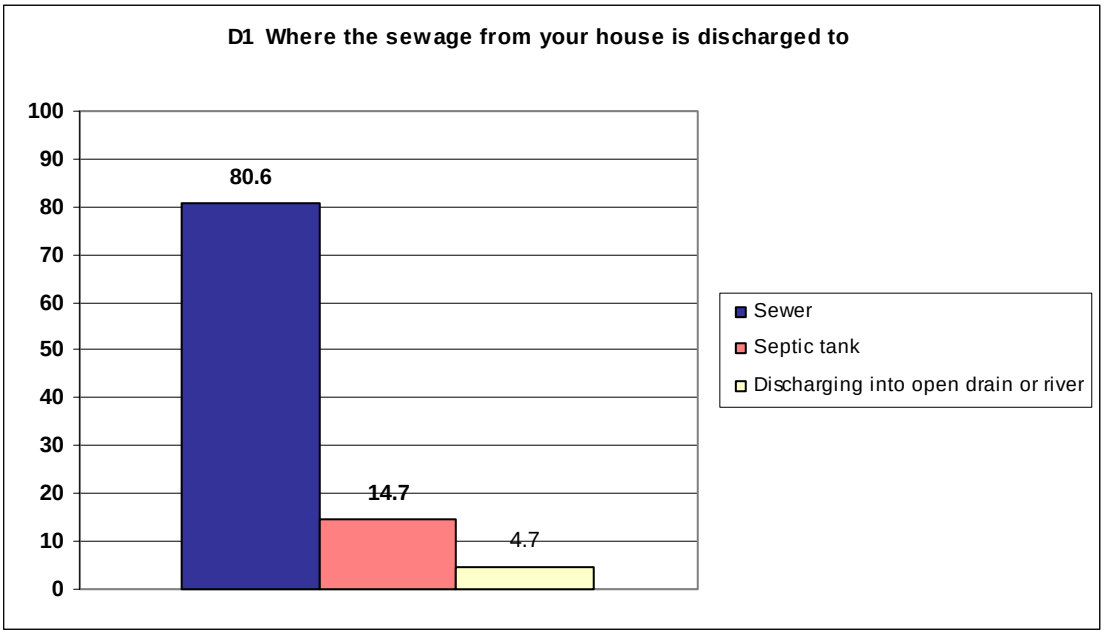
C3 Your opinion on water tariff

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Cheep	15	14.9	6	40.0	10	22.2			31	14.7
Proper level	81	80.2	9	60.0	35	77.8	40	80.0	165	78.2
Too high	3	3.0					7	14.0	10	4.7
Not reported	2	2.0					3	6.0	5	2.4
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

D. Questions on general information of sewerage system

D1 Where the sewage from your house is discharged to

	No	%
Sewer	170	80.6
Septic tank	31	14.7
Discharging into open drain or river	10	4.7
Total	211	100.0

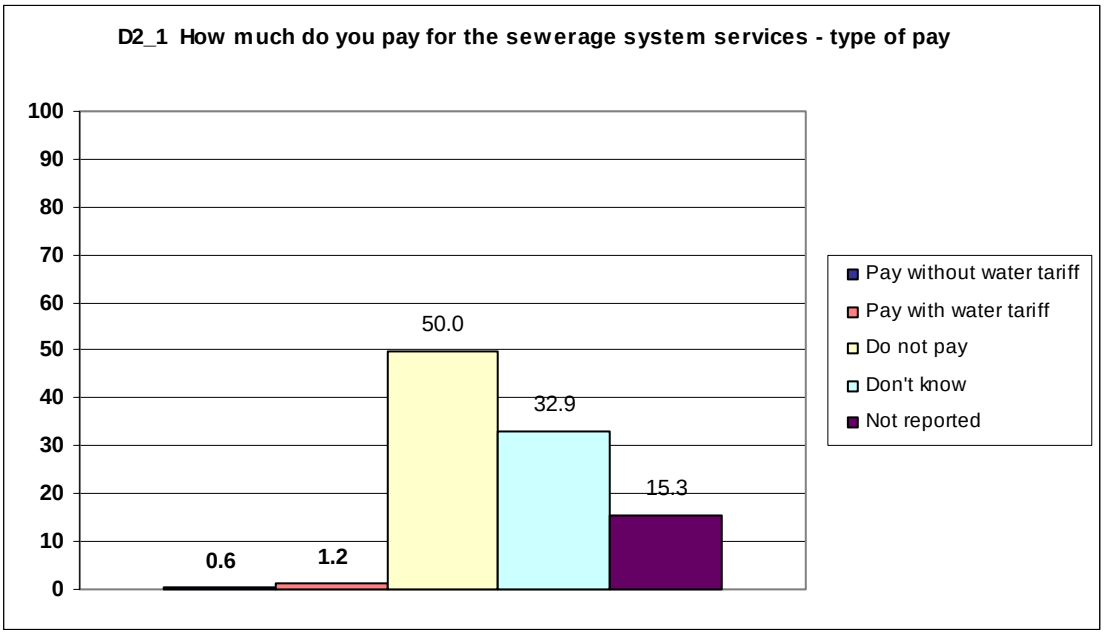


D1 Where the sewage from your house is discharged to

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Sewer	98	97.0	15	100.0	45	100.0	12	24.0	170	80.6
Septic tank							31	62.0	31	14.7
Discharging into open drain or river	3	3.0					7	14.0	10	4.7
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

D2_1 How much do you pay for the sewerage system services - type of pay

	No	%
Pay without water tariff	1	0.6
Pay with water tariff	2	1.2
Do not pay	85	50.0
Don't know	56	32.9
Not reported	26	15.3
Total	170	100.0

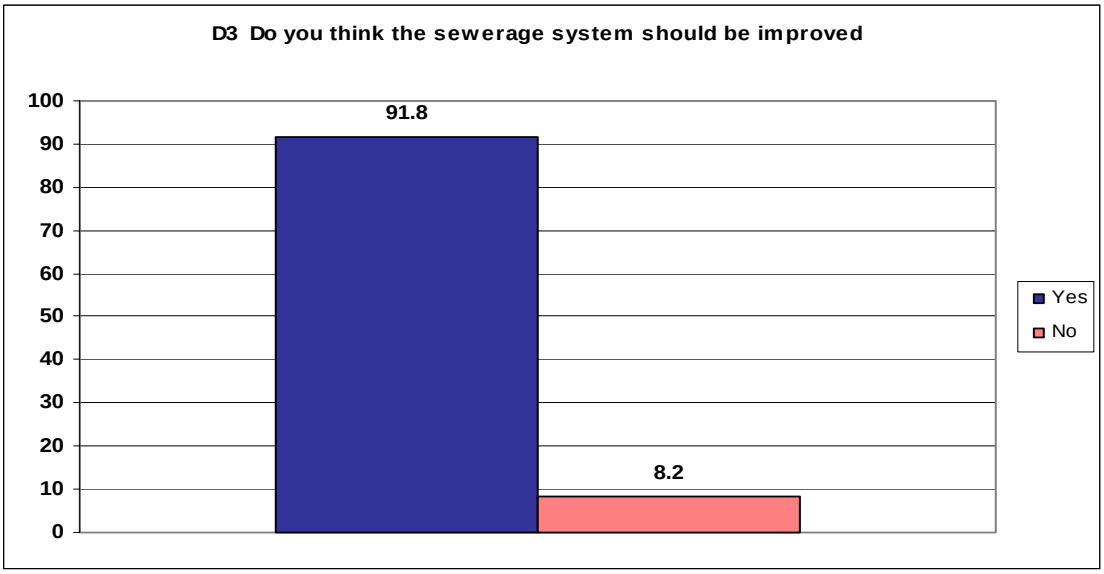


D2_1 How much do you pay for the sewerage system services - type of pay

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Pay without water tariff	1	1.0							1	0.6
Pay with water tariff	2	2.0							2	1.2
Do not pay	45	45.9	6	40.0	23	51.1	11	91.7	85	50.0
Don't know	31	31.6	9	60.0	15	33.3	1	8.3	56	32.9
Not reported	19	19.4			7	15.6			26	15.3
Total	98	100.0	15	100.0	45	100.0	12	100.0	170	100.0

D3 Do you think the sewerage system should be improved

	No	%
Yes	156	91.8
No	14	8.2
Total	170	100.0

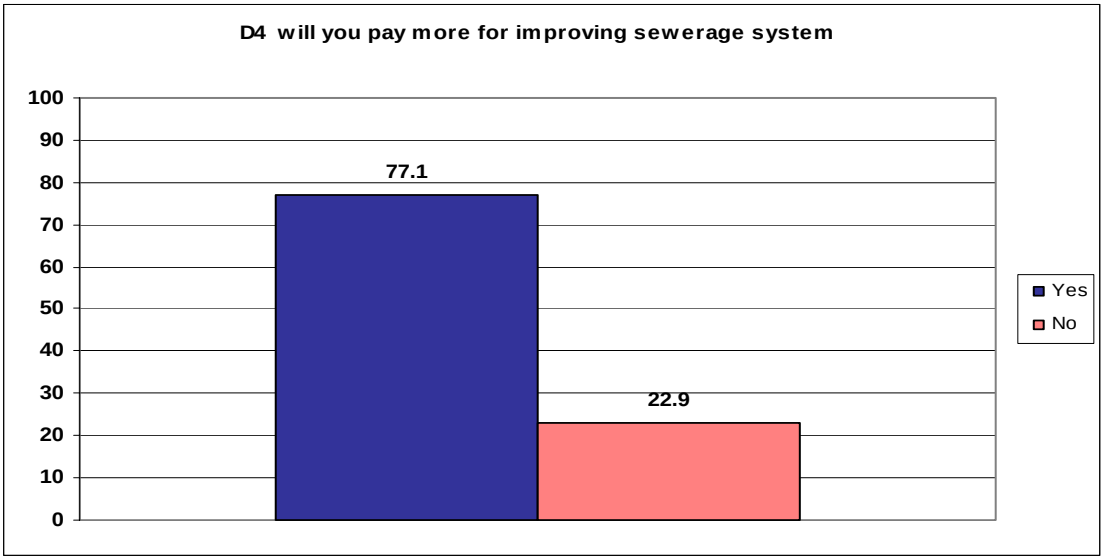


D3 Do you think the sewerage system should be improved

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes	88	89.8	12	80.0	45	100.0	11	91.7	156	91.8
No	10	10.2	3	20.0			1	8.3	14	8.2
Total	98	100.0	15	100.0	45	100.0	12	100.0	170	100.0

D4 will you pay more for improving sewerage system

	No	%
Yes	131	77.1
No	39	22.9
Total	170	100.0

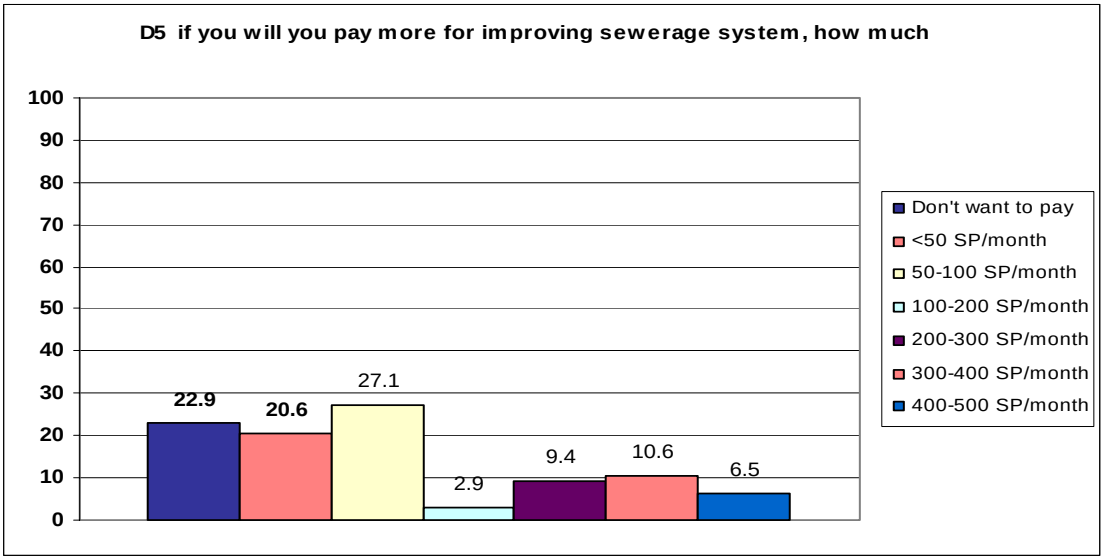


D4 will you pay more for improving sewerage system

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes	77	78.6	11	73.3	32	71.1	11	91.7	131	77.1
No	21	21.4	4	26.7	13	28.9	1	8.3	39	22.9
Total	98	100.0	15	100.0	45	100.0	12	100.0	170	100.0

D5 if you will pay more for improving sewerage system, how much

	No	%
Don't want to pay	39	22.9
<50 SP/month	35	20.6
50-100 SP/month	46	27.1
100-200 SP/month	5	2.9
200-300 SP/month	16	9.4
300-400 SP/month	18	10.6
400-500 SP/month	11	6.5
Total	170	100.0

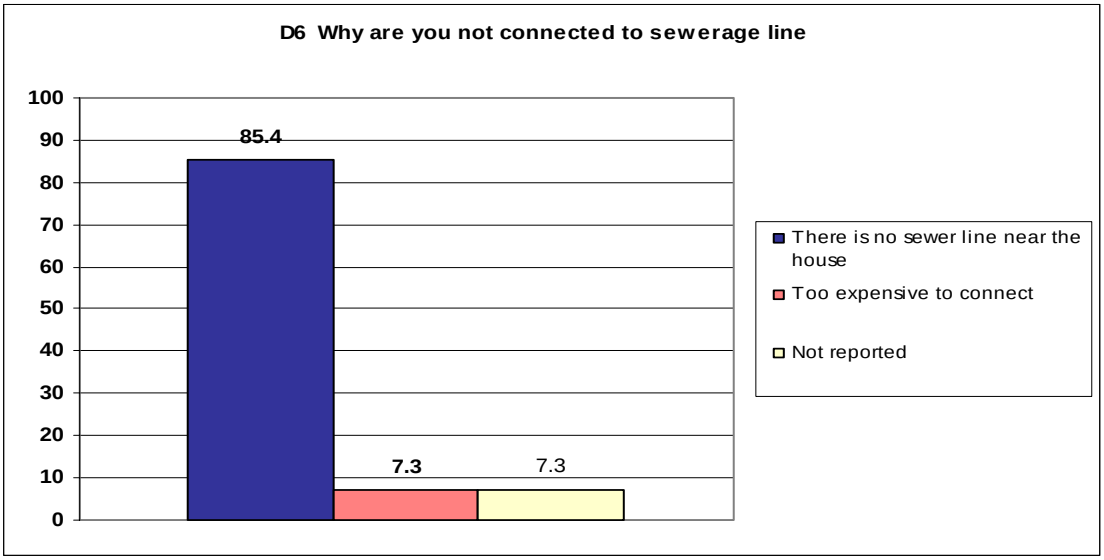


D5 if yes, how much

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Don't want to pay	21	21.4	4	26.7	13	28.9	1	8.3	39	22.9
<50 SP/month	15	15.3	1	6.7	13	28.9	6	50.0	35	20.6
50-100 SP/month	27	27.6	5	33.3	10	22.2	4	33.3	46	27.1
100-200 SP/month	4	4.1			1	2.2			5	2.9
200-300 SP/month	10	10.2	3	20.0	3	6.7			16	9.4
300-400 SP/month	15	15.3	1	6.7	2	4.4			18	10.6
400-500 SP/month	6	6.1	1	6.7	3	6.7	1	8.3	11	6.5
Total	98	100.0	15	100.0	45	100.0	12	100.0	170	100.0

D6 Why are you not connected to sewerage line

	No	%
There is no sewer line near the house	35	85.4
Too expensive to connect	3	7.3
Not reported	3	7.3
Total	41	100.0

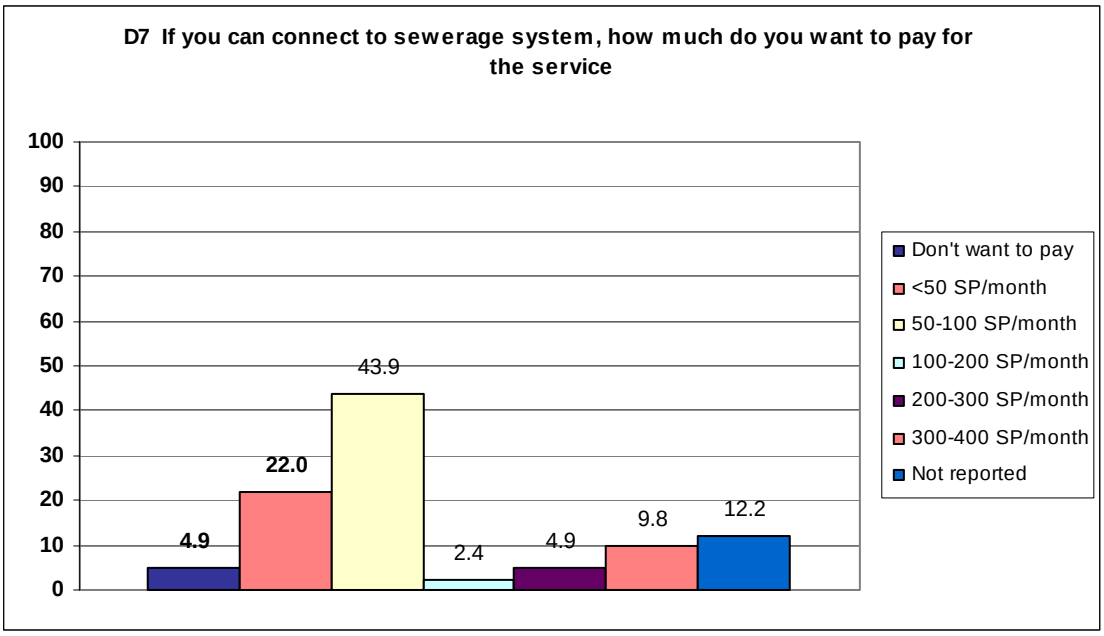


D6 Why are you not connected to sewerage line

	Zabadani		Downstream of barada river		Total	
	No	%	No	%	No	%
There is no sewer line near the house			35	92.1	35	85.4
Too expensive to connect			3	7.9	3	7.3
Not reported	3	100.0			3	7.3
Total	3	100.0	38	100.0	41	100.0

D7 If you can connect to sewerage system, how much do you want to pay for the service

	No	%
Don't want to pay	2	4.9
<50 SP/month	9	22.0
50-100 SP/month	18	43.9
100-200 SP/month	1	2.4
200-300 SP/month	2	4.9
300-400 SP/month	4	9.8
Not reported	5	12.2
Total	41	100.0



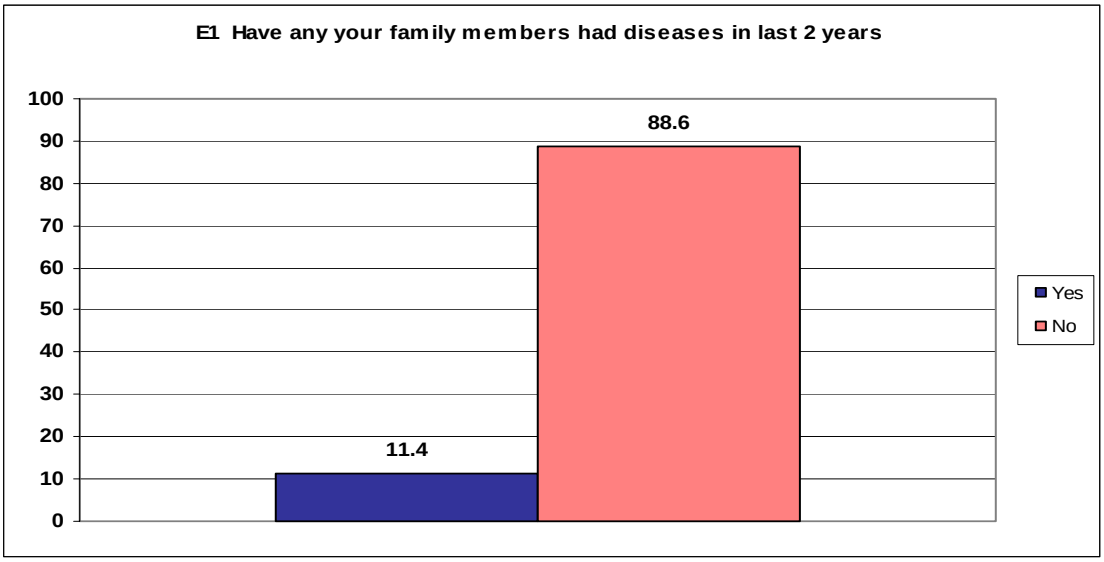
D7 If you can connect to sewerage system, how much do you want to pay for the service

	Zabadani		Downstream of barada river		Total	
	No	%	No	%	No	%
Don't want to pay			2	5.3	2	4.9
<50 SP/month			9	23.7	9	22.0
50-100 SP/month			18	47.4	18	43.9
100-200 SP/month			1	2.6	1	2.4
200-300 SP/month			2	5.3	2	4.9
300-400 SP/month			4	10.5	4	9.8
Not reported	3	100.0	2	5.3	5	12.2
Total	3	100.0	38	100.0	41	100.0

E. Questions on health and hygiene

E1 Have any of your family members had diseases in last 2 years

	No	%
Yes	24	11.4
No	187	88.6
Total	211	100.0



E1 Have any of your family members had diseases in last 2 years

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes	18	17.8			2	4.4	4	8.0	24	11.4
No	83	82.2	15	100.0	43	95.6	46	92.0	187	88.6
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

Descriptive Statistics

	N	Mean	Std. Deviation
How many days each of your family members suffers from water-related disease, such as Diarrhea, Dysentery, Hepatitis	29	17.0	8.9
How much does your family spend for health in average	188	1167.8	866.7

E2 How many days each of your family members suffers from water-related disease, such as Diarrhea, Dysentery, Hepatitis

		N	Mean	Std. Deviation
Area	Zabadani	24	16.4	9.3
	Downstream of barada river	5	20.0	7.1
	Total	29	17.0	8.9

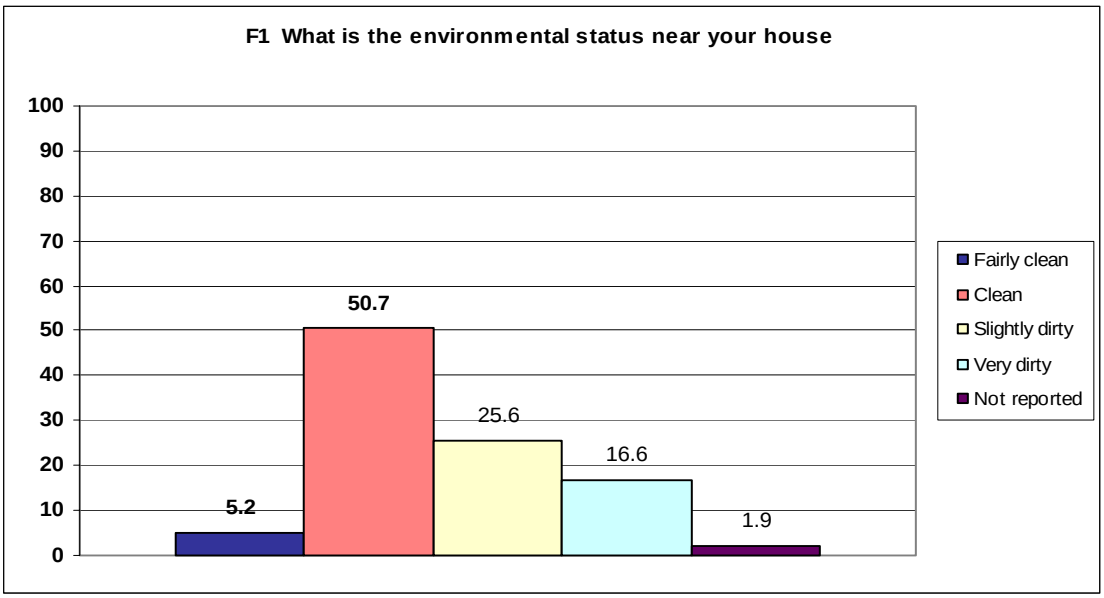
E3 How much does your family spend for health in average

		N	Mean	Std. Deviation
Area	Zabadani	89	1260.7	902.7
	Bludan	15	1473.3	1209.2
	Buqqein & Madaya	41	1087.8	777.2
	Downstream of barada river	43	945.3	682.7
	Total	188	1167.8	866.7

F. Questions on environment

F1 What is the environmental status near your house

	No	%
Fairly clean	11	5.2
Clean	107	50.7
Slightly dirty	54	25.6
Very dirty	35	16.6
Not reported	4	1.9
Total	211	100.0

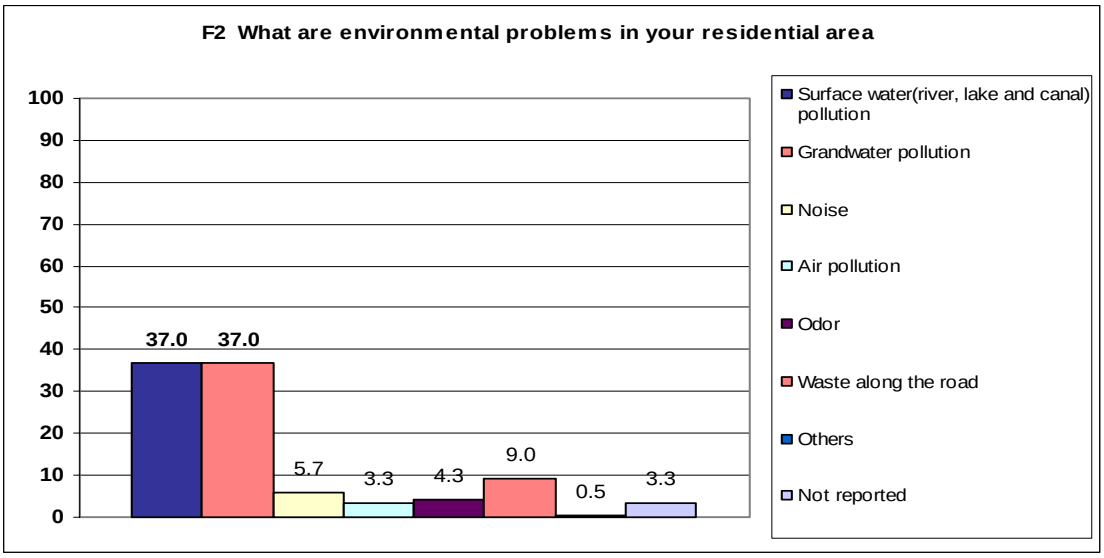


F1 What is the environmental status near your house

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Fairly clean	11	10.9							11	5.2
Clean	49	48.5	13	86.7	41	91.1	4	8.0	107	50.7
Slightly dirty	31	30.7	1	6.7	4	8.9	18	36.0	54	25.6
Very dirty	8	7.9	1	6.7			26	52.0	35	16.6
Not reported	2	2.0					2	4.0	4	1.9
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

F2 What are environmental problems in your residential area

	No	%
Surface water(river, lake and canal) pollution	78	37.0
Grandwater pollution	78	37.0
Noise	12	5.7
Air pollution	7	3.3
Odor	9	4.3
Waste along the road	19	9.0
Others	1	0.5
Not reported	7	3.3
Total	211	100.0



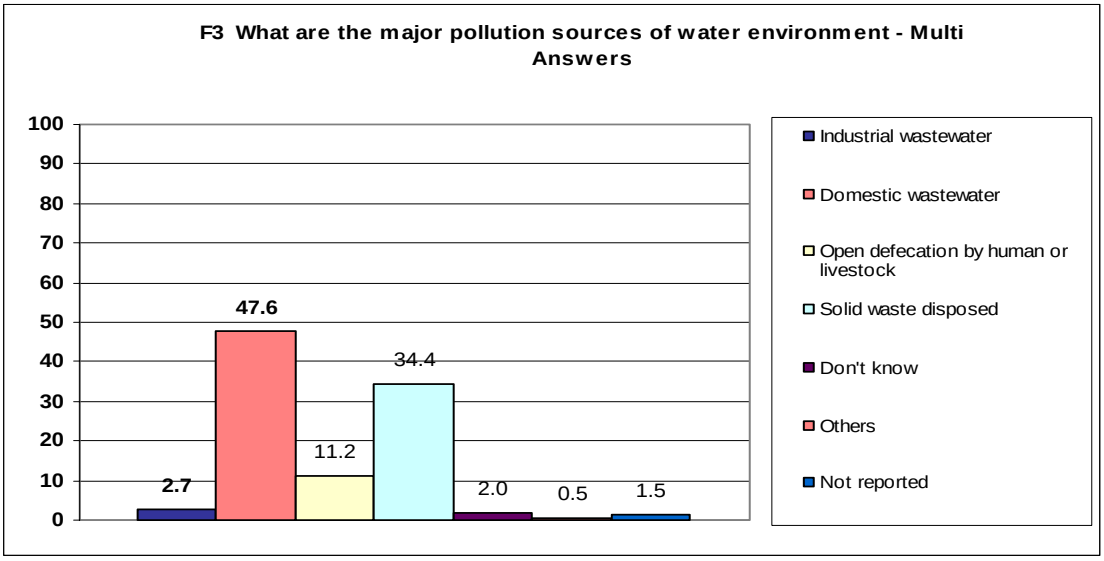
F2 What are environmental problems in your residential area

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Surface water(river, lake and canal) pollution	32	31.7	6	40.0	22	48.9	18	36.0	78	37.0
Grandwater pollution	32	31.7	6	40.0	15	33.3	25	50.0	78	37.0
Noise	11	10.9			1	2.2			12	5.7

Air pollution	5	5.0					2	4.0	7	3.3
Odor	4	4.0	1	6.7			4	8.0	9	4.3
Waste along the road	11	10.9	1	6.7	7	15.6			19	9.0
Others	1	1.0							1	0.5
Not reported	5	5.0	1	6.7			1	2.0	7	3.3
Total	101	100.0	15	100.0	45	100.0	50	100.0	211	100.0

F3 What are the major pollution sources of water environment - Multi Answers

	No	%
Industrial wastewater	11	2.7
Domestic wastewater	191	47.6
Open defecation by human or livestock	45	11.2
Solid waste disposed	138	34.4
Don't know	8	2.0
Others	2	0.5
Not reported	6	1.5
Total of answers	401	100.0
Total of interviewee	211	



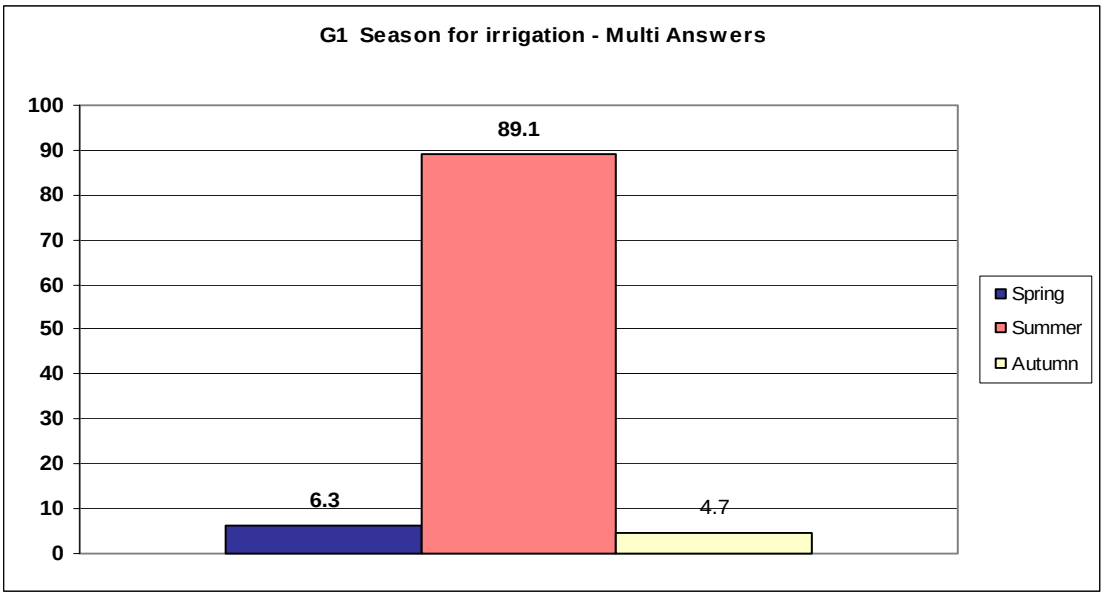
F3 What are the major pollution sources of water environment - Multi Answers

	Area								Total	
	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		No	%
	No	%	No	%	No	%	No	%		
Industrial wastewater	9	4.7	1	3.3			1	1.1	11	2.7
Domestic wastewater	89	46.4	15	50.0	39	45.3	48	51.6	191	47.6
Open defecation by human or livestock	18	9.4	11	36.7	15	17.4	1	1.1	45	11.2
Solid waste disposed	63	32.8	3	10.0	31	36.0	41	44.1	138	34.4
Don't know	7	3.6			1	1.2			8	2.0
Others	2	1.0							2	0.5
Not reported	4	2.1					2	2.2	6	1.5
Total of answers	192	100	30	100	86	100	93	100	401	100
Total of interviewee	101		15		45		50		211	

G. Questions on the irrigation

G1 Season for irrigation - Multi Answers

	No	%
Spring	4	6.3
Summer	57	89.1
Autumn	3	4.7
Total of answers	64	100.0
Total of interviewee	57	

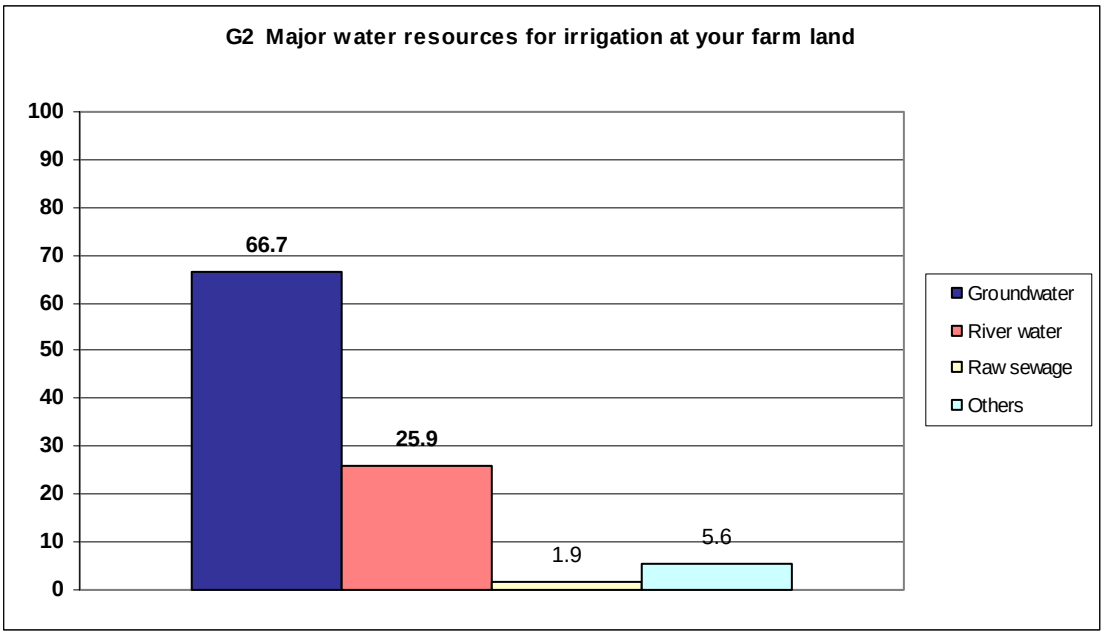


G1 Season for irrigation - Multi Answers

	Area								Total	
	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		No	%
	No	%	No	%	No	%	No	%		
Spring	1	25.0	1	50.0	2	25.0			4	6.3
Summer	2	50.0	1	50.0	4	50.0	50	100.0	57	89.1
Autumn	1	25.0			2	25.0			3	4.7
Total of answers	4	100.0	2	100	8	100.0	50	100	64	100.0
Total of interviewee	2		1		4		50		57	

G2 Major water resources for irrigation at your farm land

	No	%
Groundwater	36	66.7
River water	14	25.9
Raw sewage	1	1.9
Others	3	5.6
Total	54	100.0



G2 Major water resources for irrigation at your farm land

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Groundwater	1	50.0	1	100.0	4	100.0	30	63.8	36	66.7
River water							14	29.8	14	25.9
Raw sewage	1	50.0							1	1.9
Others							3	6.4	3	5.6
Total	2	100.0	1	100.0	4	100.0	47	100.0	54	100.0

G3 Depth of the well

		N	Mean	Std. Deviation
Area	Zabadani	1	8.0	.
	Bludan	1	750.0	.
	Buqqein & Madaya	4	487.5	154.8
	Downstream of barada river	38	41.1	37.5
	Total	44	97.1	173.0

G4 How much does your family spend for irrigation

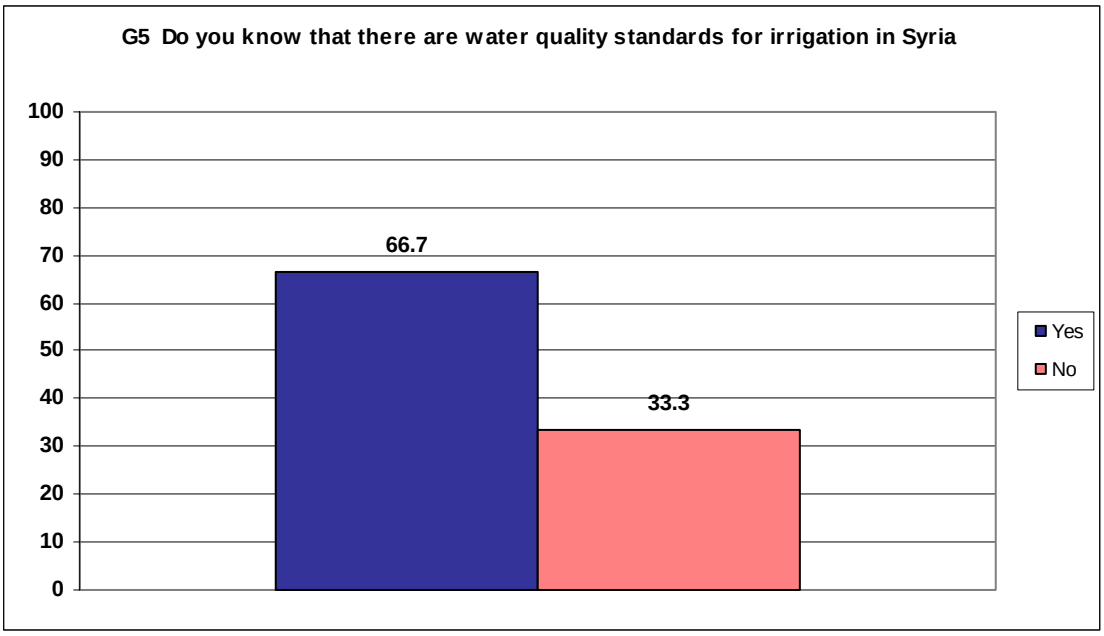
		N	Mean	Std. Deviation
Area	Zabadani	1	100.0	.
	Bludan	1	25000.0	.
	Buqqein & Madaya	3	12333.3	4618.8
	Downstream of barada river	16	2843.8	4596.1
	Total	21	5123.8	7137.7

Descriptive Statistics

	N	Mean	Std. Deviation
Depth of the well	44	97.1	173.0
How much does your family spend for irrigation	21	5123.8	7137.7

G5 Do you know that there are water quality standards for irrigation in Syria

	No	%
Yes	38	66.7
No	19	33.3
Total	57	100.0

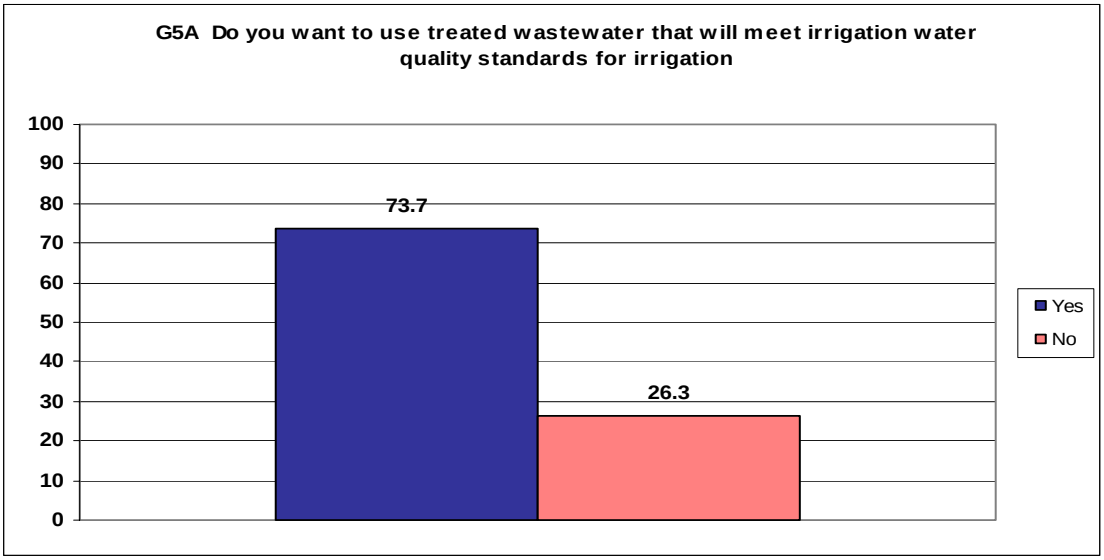


G5 Do you know that there are water quality standards for irrigation in Syria

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes	1	50.0	1	100.0	4	100.0	32	64.0	38	66.7
No	1	50.0					18	36.0	19	33.3
Total	2	100.0	1	100.0	4	100.0	50	100.0	57	100.0

G5A Do you want to use treated wastewater that will meet irrigation water quality standards for irrigation

	No	%
Yes	42	73.7
No	15	26.3
Total	57	100.0



G5A Do you want to use treated wastewater that will meet irrigation water quality standards for irrigation

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes	1	50.0	1	100.0	4	100.0	36	72.0	42	73.7
No	1	50.0					14	28.0	15	26.3
Total	2	100.0	1	100.0	4	100.0	50	100.0	57	100.0

Descriptive Statistics

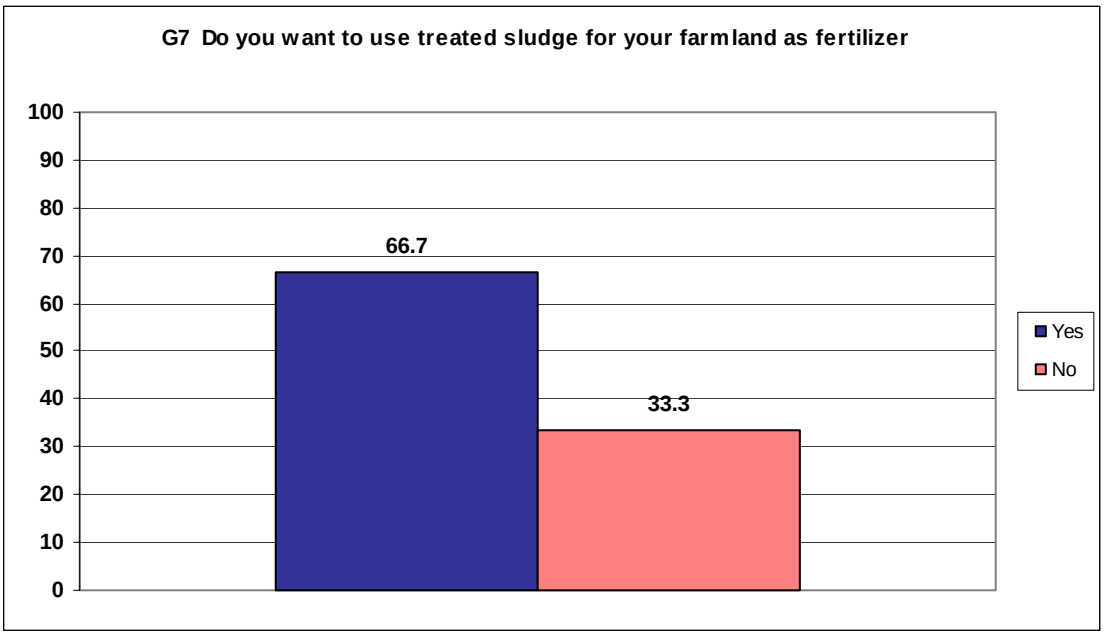
	N	Mean	Std. Deviation
If yes, how much do you want to pay for treated wastewater	41	782.9	1067.2

G6 If you want to use treated wastewater that will meet irrigation water quality standards for irrigation, how much do you want to pay for treated wastewater

		N	Mean	Std. Deviation
Area	Zabadani	1	200.0	.
	Bludan	1	5000.0	.
	Buqqein & Madaya	4	3000.0	816.5
	Downstream of barada river	35	425.7	196.1
	Total	41	782.9	1067.2

G7 Do you want to use treated sludge for your farmland as fertilizer

	No	%
Yes	38	66.7
No	19	33.3
Total	57	100.0



Descriptive Statistics

	N	Mean	Std. Deviation
If yes, how much do you want to pay for treated sludge	38	301.3	385.8

G7 Do you want to use treated sludge for your farmland as fertilizer

	Zabadani		Bludan		Buqqein & Madaya		Downstream of barada river		Total	
	No	%	No	%	No	%	No	%	No	%
Yes					3	75.0	35	70.0	38	66.7
No	2	100.0	1	100.0	1	25.0	15	30.0	19	33.3
Total	2	100.0	1	100.0	4	100.0	50	100.0	57	100.0

G8 If you want to use treated sludge for your farmland as fertilizer, how much do you want to pay for treated sludge

		N	Mean	Std. Deviation
Area	Buqqein & Madaya	3	1500.0	500.0
	Downstream of barada river	35	198.6	98.1
	Total	38	301.3	385.8

Conclusion

Following to analyzing the different charts information, we can remark:

- 78.2% of the interviewees believe that water tariff is at proper level, taking into information that only 47.9% of houses are connected to the drinking water net and 36% buy water from private sellers.
- In Barada downstream there is no drinking water net, 62% of houses relay on wells and 32% buy water.
- In Zabadani, Bludan and Buqqein sewage is discharged to sewerage networking 100%, whereas in Barada downstream 62% is discharged to septic tanks and 14% to the open river.
- 50% of interviewees do not pay now for sewerage system, 91.8% say the system needs to be improved and 77.1% are willing to pay for improving the sewerage system.
- 27% of interviewees who are willing to pay can pay 50 – 100 S.P/month to improve the sewerage system, taking into consideration that the monthly income average is 23000 S.P.
- 19.4 % of sampled houses are not connected to sewerage line; where the large part of them (16.6%) has no close sewer line. From the not connected houses 43.9% are willing to pay 50 – 100 S.P for net connecting.
- 52% of Barada interviewees evaluate the environmental condition in their residential area as very polluted; 86% believe that the environmental problem is the pollution of ground water and surface water; and 47.6% believe that the main source of water pollution is domestic sewage.
- In Barada downstream 73% want to use treated wastewater that will meet water quality standards for irrigation, and they are willing to pay an average of 785 S.P for that.
- In Barada downstream 66.7% want to use treated sludge as fertilizer, and they are willing to pay an average of 300 S.P for that.

Appendix 4

Topographic Survey

1.1 Technical Specifications

1.1.1 Purpose of the Topographic Survey

Topographic survey shall be carried out to prepare a basic engineering design of the new STP (Sewage Treatment Plant) and Trunk sewer.

1.1.2 Study Area

The Survey Areas shall be in Zabadani, Rural Damascus governorate. The details will be provided by the Engineer.

1.1.3 Scope of Work

The survey shall be carried out in the specified locations as described below and shown on Drawings to be provided by the Engineer:

(1) STP

Plane table surveying:

1 sites, Area: About 5.5ha (55,000 m^2)

Scale: 1/500, contour every 1 m

Cross-section chart:

Scale: 1/500, every 50m in each direction of sites

*Including channel beside STP (water level also shall be surveyed)

Location map scaled 1/10,000 shall be also prepared.

(2) Trunk Sewer

Route surveying:

Length of pipelines 0.5 km

Plane table surveying Scale: 1/1,000, Width 20m

Route survey longitudinal chart Scale Horizontal: 1/1000, Vertical: 1/100

Route survey cross-section chart Scale: 1/100, Width 20m, every 25m

*The required elevations include those at road crossings, bridges, bottom level and water level of rivers, top of high points and bottom of low points. The interval of level measurements shall not be less than 25 m.

Location map scaled 1/10,000 shall be also prepared.

1.1.4 Benchmark

Leveling survey shall be started from Benchmarks authorized by Syrian Government, photos and authorized data of referred benchmarks shall be presented in the report.

1.1.5 Report and Final Products to be Submitted

(1) All the report and final products shall be submitted in English.

(2) The Contractor shall deliver the following final products to the Engineer:

1) Survey result
   - Original 1 set
   - Photocopy 2 sets

   STP:
   - Plan (Scale: 1/500)
   - Cross-section profile sheet (Scale: 1/500)

   Trunk Sewer:
   - Plan (Scale: 1/1,000)
   - Longitudinal profile sheet (Scale: H=1/1000, V=1/100)
   - Cross-section profile sheet (Scale: 1/100)

2) Location map Scale: 1/10000 1 set
3) Survey data 1 set
4) Final report 1 set

   Final report shall include location map, benchmark referred, process of survey method, instruments used for survey, results of accuracy control and other necessary information.

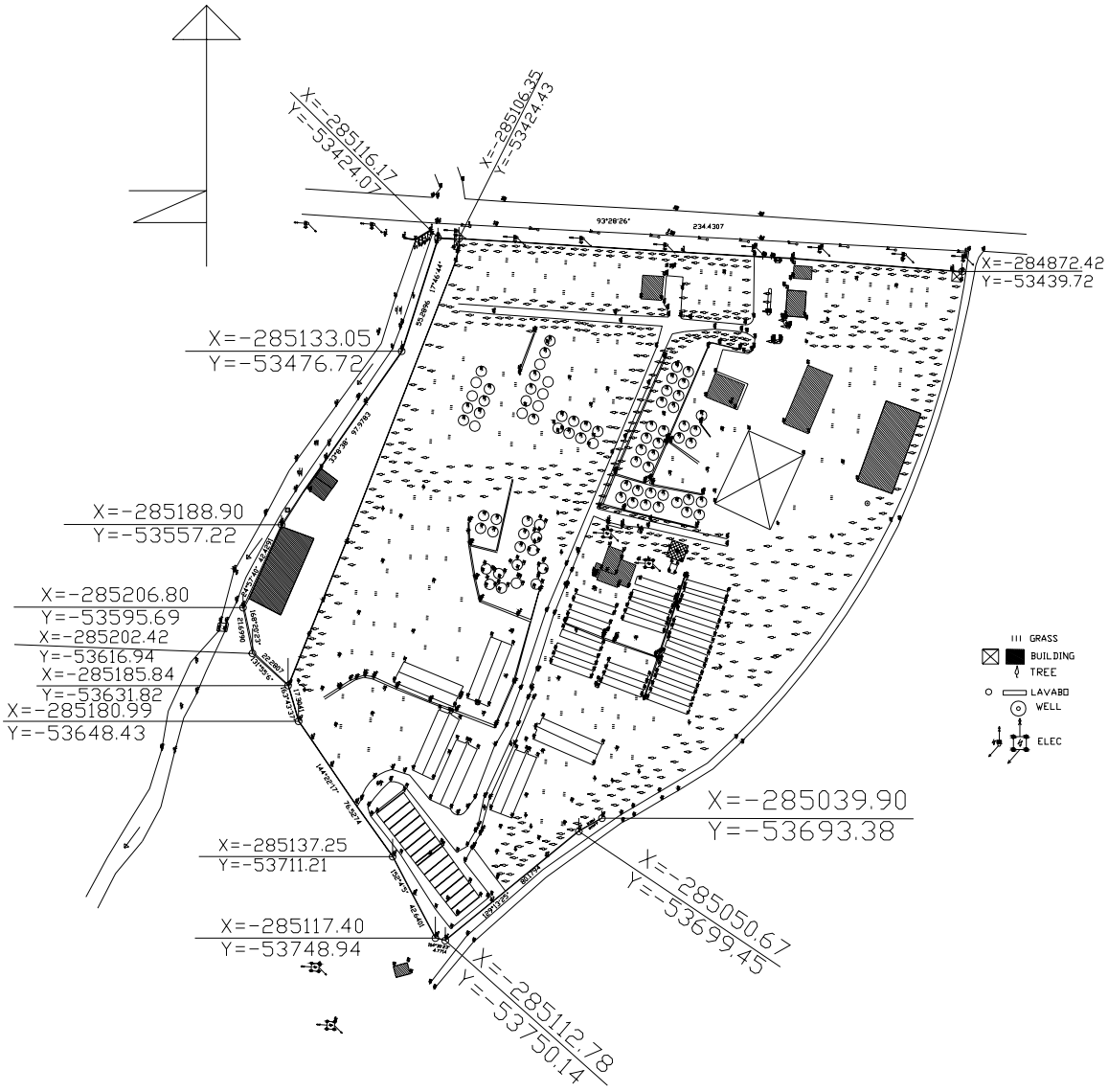
3) Electronic files to be contained in CD-ROM shall be submitted along with the reports 1) and 2) described above. Texts and tables shall be prepared either in Microsoft Word or Microsoft Excel . The map and surveyed results shall be prepared by AutoCAD program. Electronic files of figures shall be provided in DWG format.

(3) Unless otherwise specified in this Specification, the survey shall be carried out in accordance with the Syrian Standard of specifications and/or regulations.

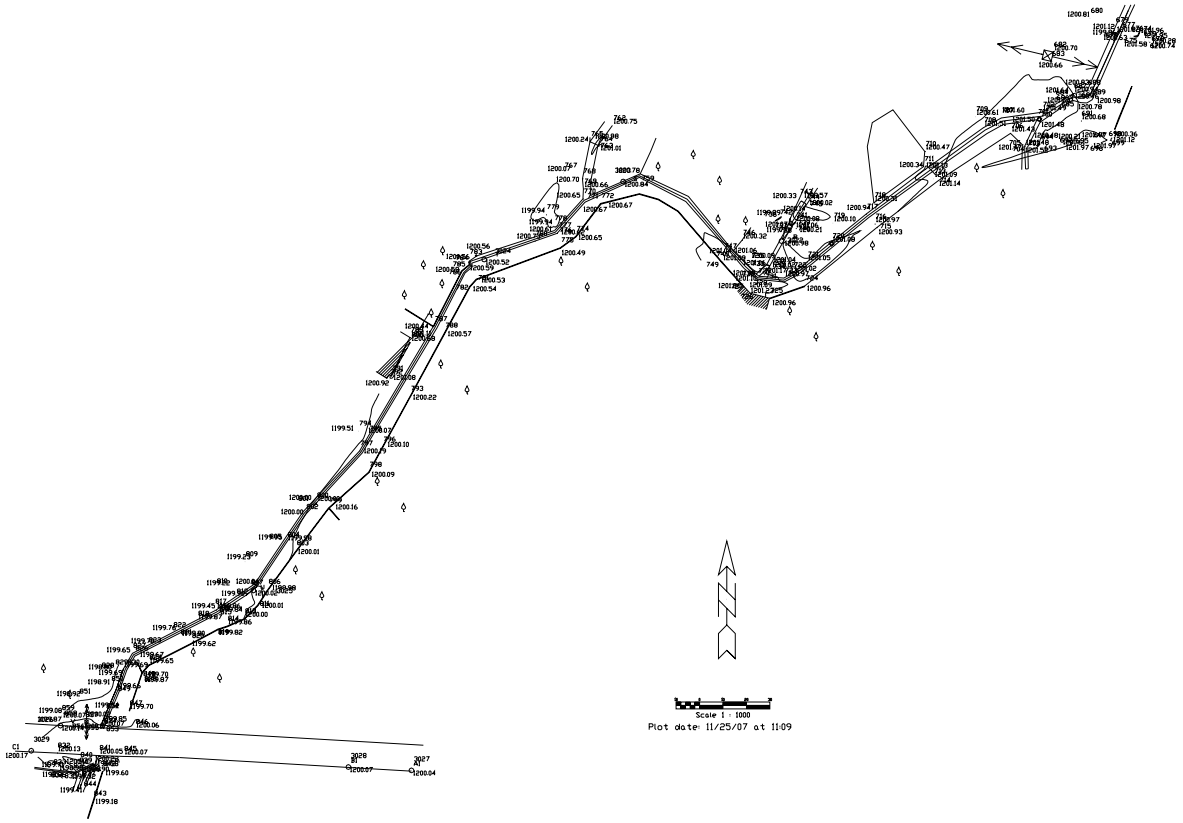
(4) The work shall be started immediately upon receipt of the Notice to Proceed and the report shall be submitted to the Engineer by **5 November, 2007**.

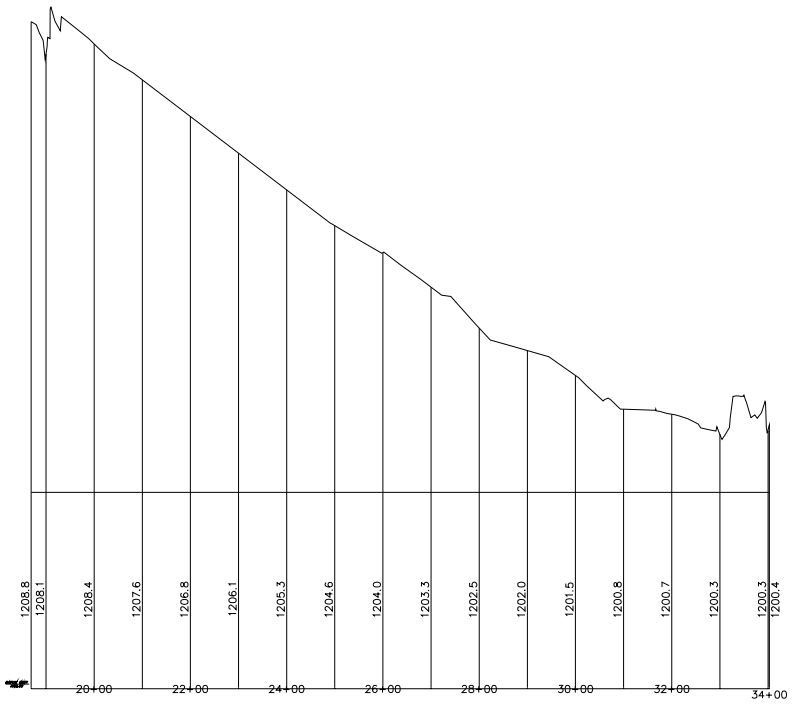
1.2 Summary of the Results of Survey

STP－PLAN



Trunk Sewer－PLAN, Longitudinal profile sheet





Appendix 5

Soil Survey

1.1 Technical Specifications

1.1.1 Purpose of the Geotechnical Survey

The design of new sewage treatment plants and trunk sewer are to be prepared in this Project. The basic information on the geology, soils, and groundwater levels at the proposed sites for new sewage treatment plants are necessary for this purpose.

1.1.2 Location of Boring Field

Locations of boring fields shall be in Zabadani, Rural Damascus governorate. The details will be provided by the Engineer.

1.1.3 Conditions and Requirements of the Soil Investigation

(1) Method of the Soil Investigation

Boring test means standard penetration test.

(2) Quantity of the Soil Investigation

<Boring Test>

Number of Boring:	5 points (All in the proposed STP site)
Boring depth:	15m
(If N-values are more than 50 for consecutive 5m, boring shall be stopped.)	
Standard penetration:	every 1m at each boring point
Groundwater depth:	at each boring point

< Laboratory Test>

Test Item:	Density, Specific gravity, Water content
Sample:	3 samples in every point (3 x 5points=15 samples)

(3) Survey of Boring Points

Location and elevation of all boring points shall be surveyed.

1.1.4 Manner of Survey

The boring test shall be conducted in accordance with the following manner.

At every 1.0m intervals the Standard Penetration Test shall be carried out up to 15m in order to determine the load bearing capacity of the different strata. If the N-value of 50 is encountered continuous 5m, boring test can be stopped. Collected samples are to be logged descriptively indicating the soil types and stratum characteristics to evaluate the suitability for construction of the structures.

The depth of the water table shall be measured from the surface of the borehole. The level of the water shall be measured and recorded daily. Unless otherwise specified in this Specification, All drilling, sampling and testing shall be carried out in accordance with the Syrian Standard of specifications and/or regulations.

1.1.5 Report

Results of the survey shall be summarized in English. The original and two (2) copies shall be submitted to the Engineer. The report shall include at least the following data and information:

1) Geological setting and sub-surface stratum
2) Borehole logs with soil samples, in core boxes
3) Water table criteria
4) Soil classifications and descriptions
5) Engineering application of the sub-surface.
6) Recommendations for foundation designs and trenching, embankments and fills
7) Maps showing locations of the boreholes
8) Elevation of boring sites
9) Results of laboratory tests
10) Photographs showing sceneries of the work with soil samples
11) Other relevant information/data obtained during the soil investigation

1.1.6 Schedule

The work shall be stated immediately upon receipt of the Notice to Proceed and the reports shall be submitted to the Engineer by **5 November, 2007**.

1.2 Summary of the Results of Survey

Geological Context:
From geological point of view, the site is belonging to the Neogene / lower Miocene Oligocene system; the substratum is composed mainly from limestones, clay and gravels.

Programme of Investigations:

Field Investigations:

The performed investigations included the following field works:

(5) Boreholes drilled using a rotary drilling Italian machine. Boring depths extended to about (15) m below ground level. The size of boreholes is about 100 mm, good recovery in cohesive soil is achieved. Undisturbed and disturbed samples are obtained and selected core sections are used for laboratory testing.
Standard Penetration Tests are carried out in intervals of about 1 – 1.5 m in all borings, N-values are recorded.
Groundwater table depth is measured from the surface of each borehole point.

Laboratory Investigations:

Upon completion of the field sampling operations, samples were transported to the laboratory for testing.
The representative samples were then subjected to the following laboratory tests, as required to determine the physical, mechanical, and strength characteristics of the soil formation.

- Natural Water Content.
- Natural Unit Weight, wet and dry.
- Specific Gravity.

Some of laboratory test results are shown in the Appendices.

1.2.1 Results of site investigations:

Regarding all the subsurface investigations results, the following strata are encountered in general:

- Fill top soil, its average thickness is about (0.5) m, encountered in BH1, BH2 and BH5 only.
- Dark grey, wet, stiff, high plasticity, silty clay with some sand is encountered till a depth of about (3 – 7.5) m.
- Alternation between hard and solid dense light yellowish brown mixture of gravel, sand and clay with some boulders layer; or light brown, dense, high plasticity, silty clay with some sand and gravel layer, that extends to the end of all drillings.
- All borings are free from any cavities.

Ground water table is reached at the depth of about (3.5 – 5) in all boreholes; it is very shallow in this region, it reach about 2 m under ground level at the end of winter.

1.2.2 Results of tests investigations:

The laboratory and field tests results (ASTM used) indicate the following averages for the properties of soil encountered in the site:

Clay samples	
Natural water content:	17.3 – 30.1 %
Natural unit weight:	1.87 – 2.08 kg/cm^3
Dry unit weight:	1.46 - 1.77 kg/cm^3
Specific gravity:	2.52 - 2.68 kg/cm^3
Sieve analysis:	Gravel: 5 % Sand: 15 % Silt & clay: 80 %
Direct Shear Test:	Cohesion: 0.3 kg/cm^2 Friction Angle: 12°
Classification (USC):	CH
SPT:	N = 10 – >50
Elasticity Module:	50 kg/cm^2
Poisson's Ratio:	0.3
Modulus of Sub grade Reaction:	k_s = 3 kg/cm^3

Gravel samples	
Natural water content	12.7 – 18 %
Natural unit weight	2.03 – 2.2 kg/cm^3
Dry unit weight	1.78 - 1.92 kg/cm^3
Specific gravity	2.57 - 2.72 kg/cm^3
Sieve analysis	Gravel: 70 % Sand: 15 % Silt & clay: 15 %
Direct Shear Test	Cohesion: 0.05 kg/cm^2 Friction Angle: 33°
Classification (USC)	GC
SPT	N = >50
Elasticity Module	400 kg/cm^2
Poisson's Ratio	0.25
Modulus of Sub grade Reaction:	k_s = 10 kg/cm^3

1.2.3 Analysis of Results:

The allowable soil pressure will be governed either by bearing capacity considerations or by settlement considerations. Soil profile reveals that piles must be used under structures for founding, there longitude and diameter depend mainly on the real loadings, piles will inter in the light brown mixture of gravel, sand and clay layer. It is possible to use mat footing for structures, if loads are light, this footing ought to be placed on the silty clay layer at a depth not less than 4m from ground level.

The bearing will be studied by the approach of the bearing capacity factors originally proposed by Terzaghi, according to which the ultimate bearing capacity of a square footing of width B, placed at a depth of D in such a soil, is given by the following expression:

$$Q_{ult} = 1.3\ C\ Nc + \gamma\ D\ Nq + 0.4\ \gamma\ B\ N\gamma$$

Where: Nc, Nq and Nγ are the bearing capacity factors which depend on the angle of friction.

C is the unit cohesion.

γ is the effective unit weight of soil.

Considering 1.5 kg/cm^2 as allowable bearing capacity as result for clay soil.

As settlement considerations, calculating the estimated settlement, transmitting a maximum pressure of 1.5 kg/cm^2. Due to the properties of the soil, the elastic relationship will be utilized to analysis the settlement of footings, which is:

$$S = Qo\ B\ Iw\ \ (1 - \upsilon^2) / Eo$$

Where: Qo Intensity of contact pressure.

B Least lateral dimension of footing.

Iw Influence factor which depends on shape of footing and its rigidity.

υ Poisson`s ratio.

Eo Modulus of Elasticity.

The total settlement and the differential settlement under mat foundation are in the range allowable values.

Recommendations and Conclusions:

Depending on field and laboratory investigations and our geotechnical experience of the proposed area, it is believed that the soil on the location is capable of carrying the constructions safely only if the following recommendations are respected:

1. The foundation exploration conducted at the proposed site of the project has revealed that the soil of the foundations consists mainly of wet, stiff silty clay with some sand, then light brown hard and dense mixture of gravel, sand and clay, which is suitable for founding. Ground water table is reached at the depth of about (3.5 – 5) in all boreholes; it is very shallow in this

region, it reach about 2 m under ground level at the end of winter.

2. Piles must be used under structures for founding, there longitude and diameter depend mainly on the real loadings, piles will inter in the light brown mixture of gravel, sand and clay layer. It is possible to use mat footing of foundations required by the structures if loads are light enough.
3. Footing of structure ought to be placed on the original soil, which is stiff silty clay, at minimum depth of 4m below the original ground level, not less than 20cm of lean concrete must be used under foundation.
4. The allowable bearing capacity of the above soil strata at the recommended depth is 1.5 kg/cm^2.
5. At the above soil pressure there will be an ample factor of safety against shear failure of the soil, and the total settlement and the differential settlements expected to occur are allowable.
6. It is necessary, during the excavation, to check the soil by visual inspection and to be sure to place the foundations on the solid considered layer. This will de made by a soil engineer before the execution of concrete work.
7. Soil foundation surface must be protected from all superficial reach of water, buried piping must be waterproofed. Ground water must be pumped out of pits or piles just before concrete pouring.
8. The existing silty clay is not suitable for backfilling. Any structural backfilling must be achieved by using imported gravel selected material.
9. For excavation in clay a backhoes or a tractor loader could be used. Slopes are applicable for cuts of temporary duration to total height of 4m.
10. The coefficient of lateral earth pressure will depend mainly on the selected compacted graveled materials used for backfilling back of retaining walls.
11. Upon the project recommendations, the structural design must fulfill Zone (3) based on Uniform Building Code (UBC) 1997.

Unforeseen Conditions:

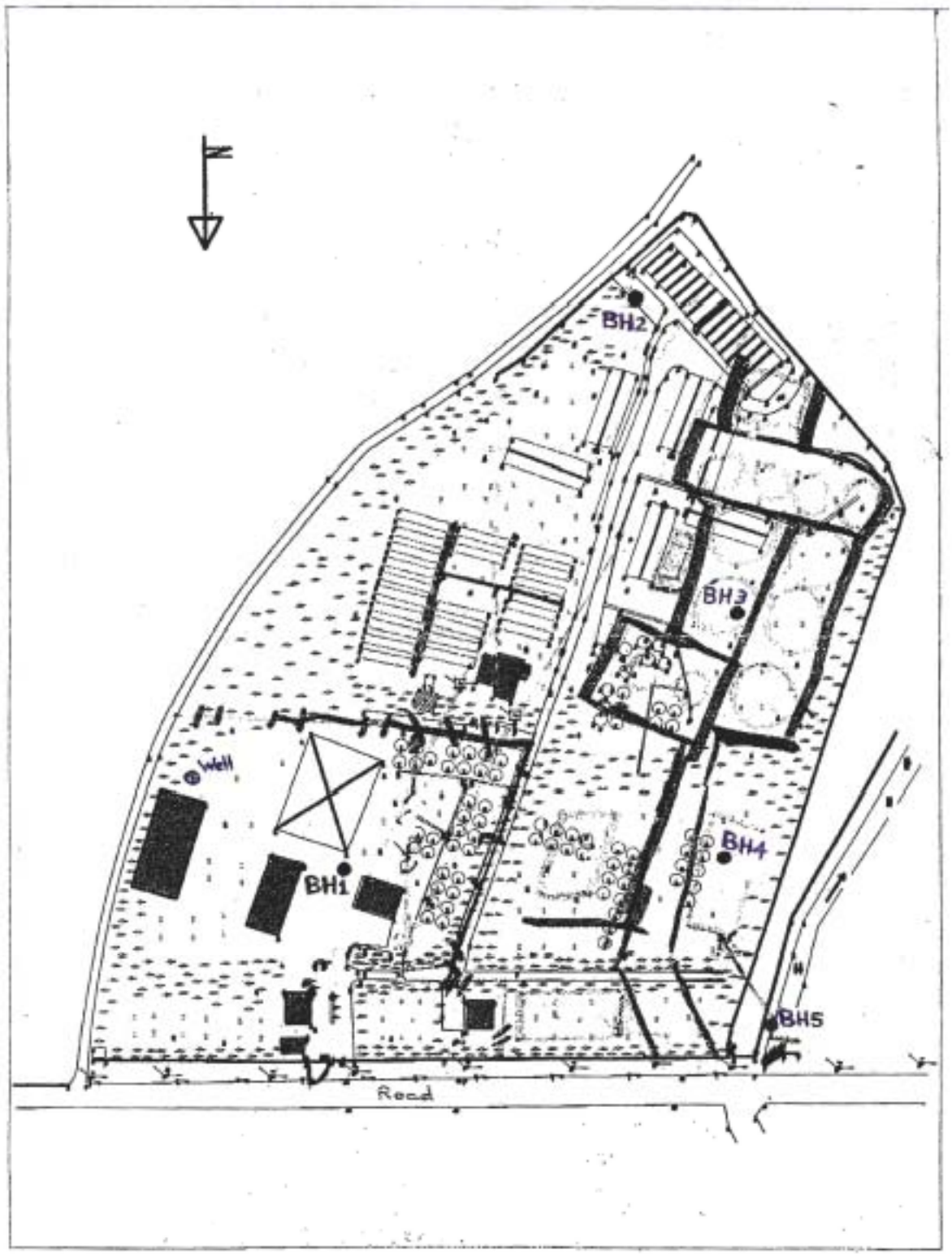
The conclusions and recommendations contained in this preliminary report are based on reasonable but limited amount of subsurface investigation work. It is necessary to assume a continuity of subsoil conditions in order to make economical conclusions and recommendations.

In the event that conditions other than these described herein are encountered during construction and after excavation, it must be reported to our office.

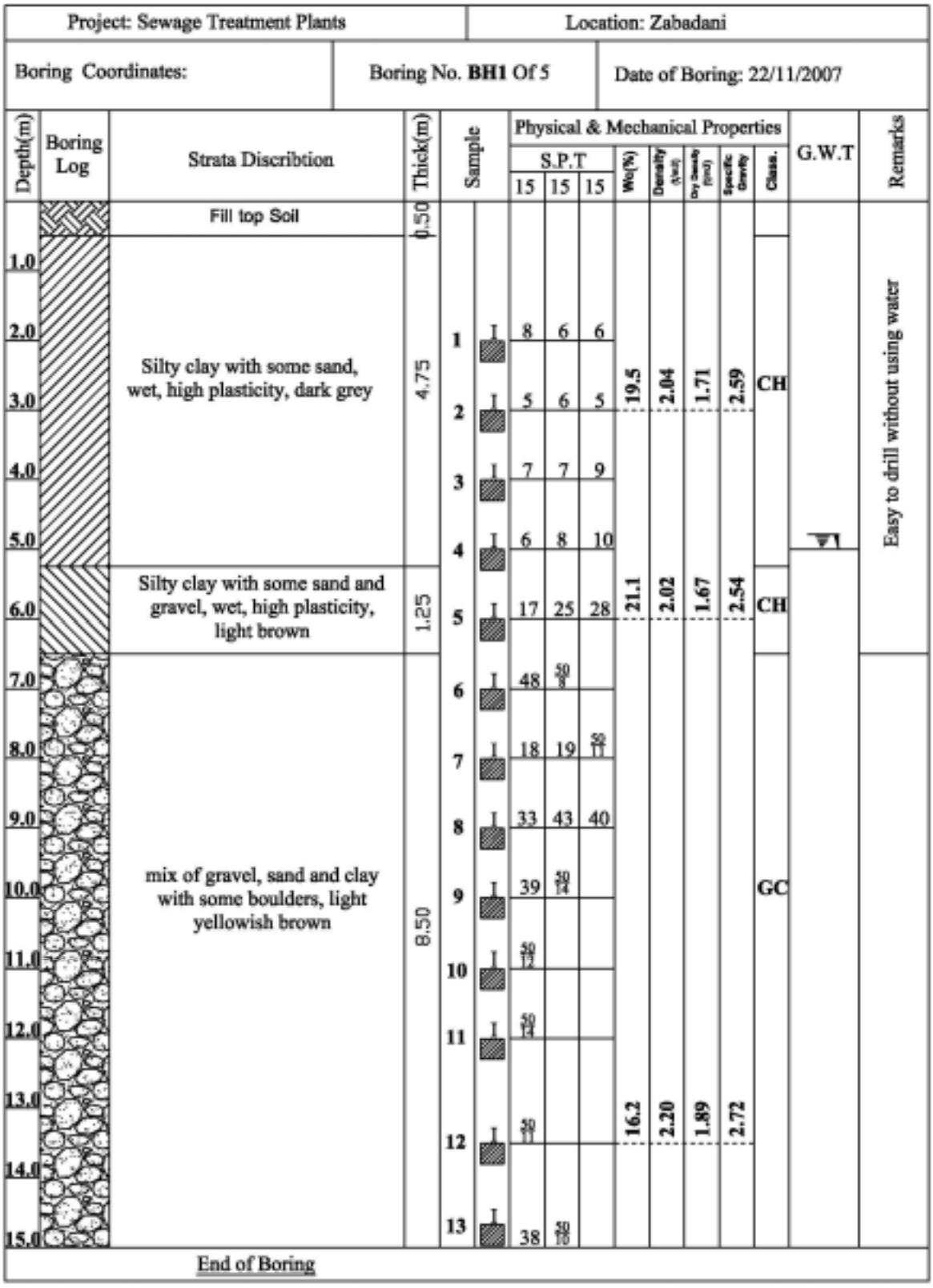
A supplementary and final report and recommendations should be made for each structure.

Our findings were obtained and recommendations were prepared in accordance with generally accepted professional engineering practices.

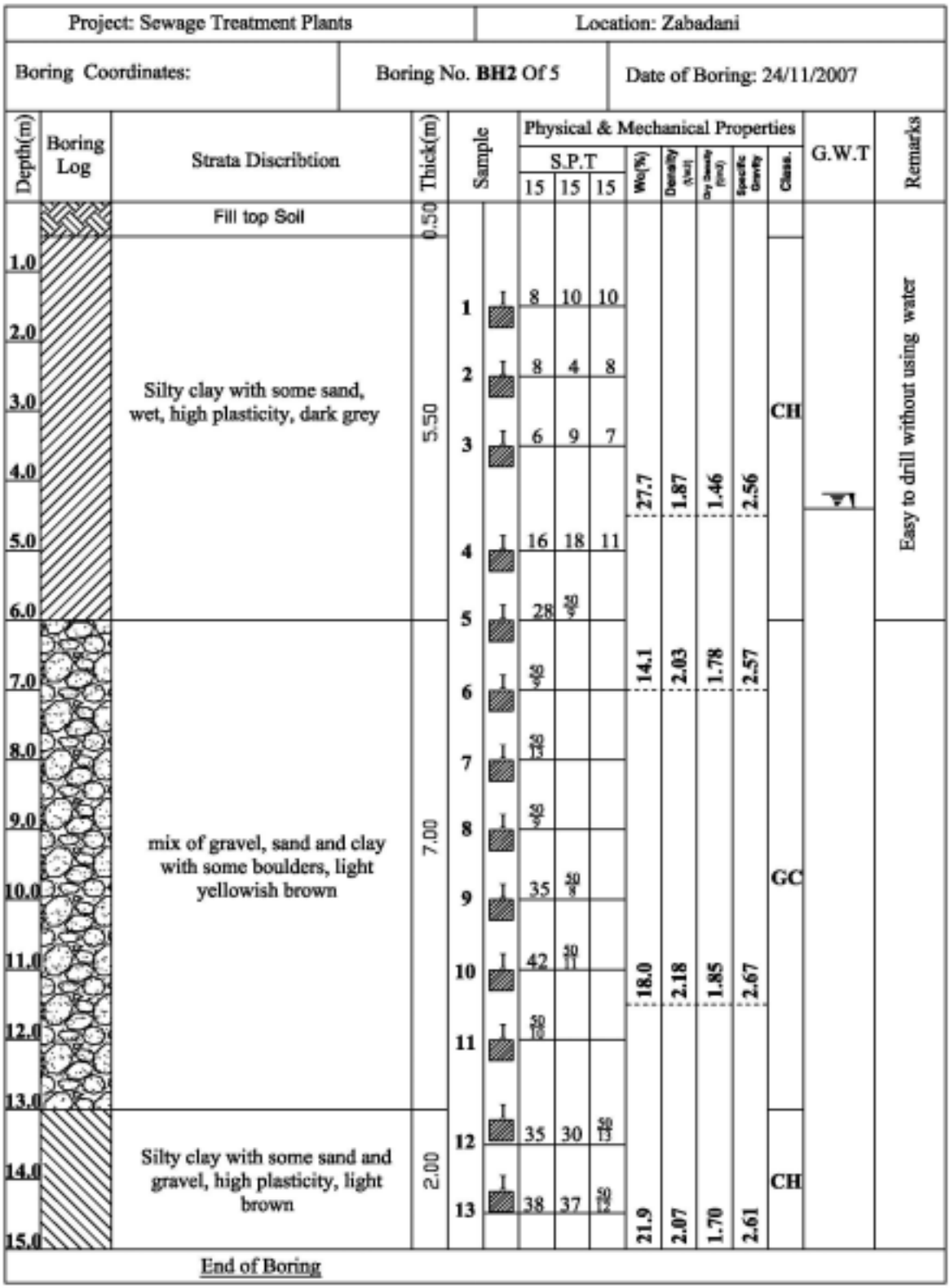
(1) Location Map of Boreholes



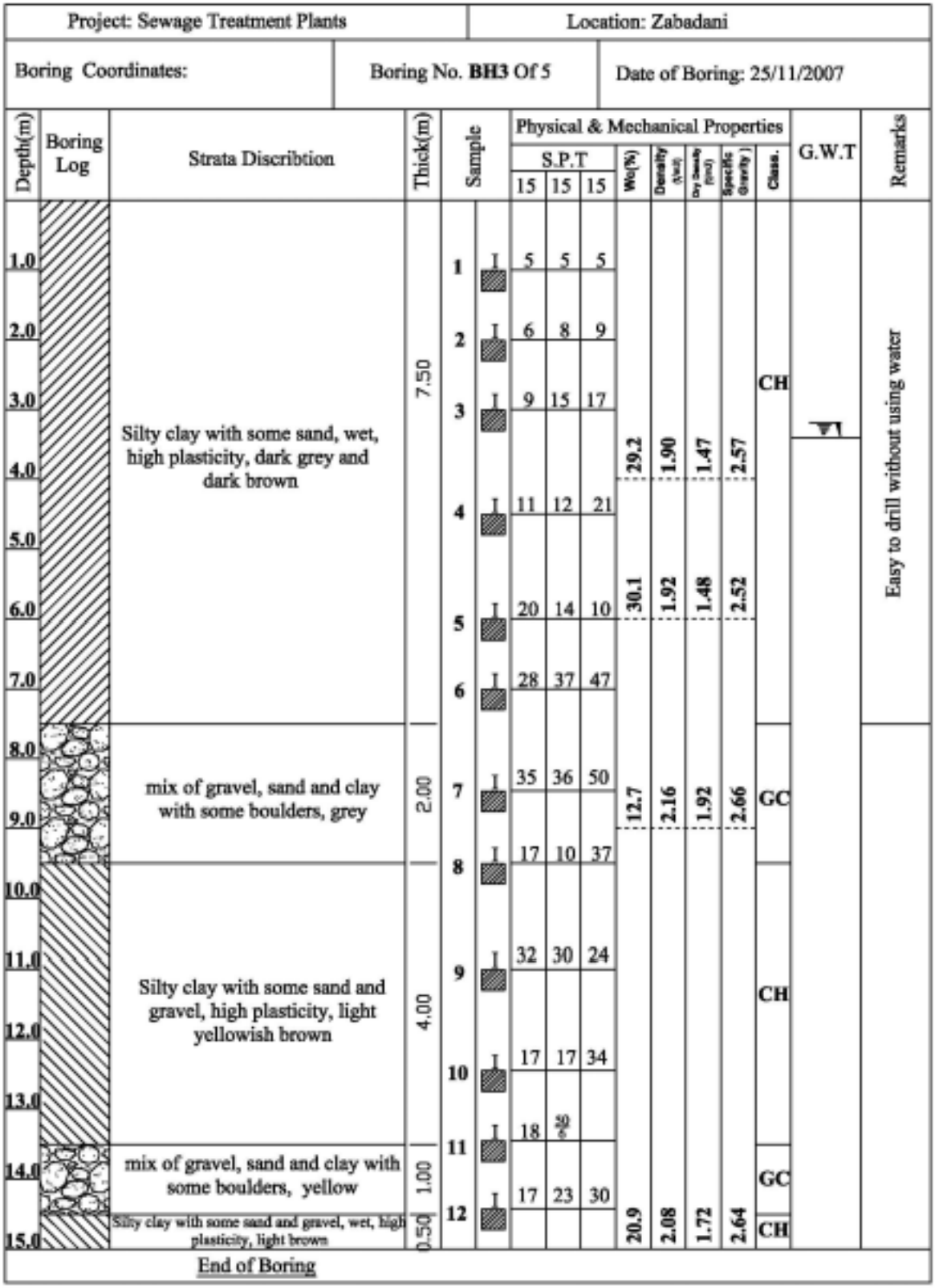
(2) Result of BH NO.1



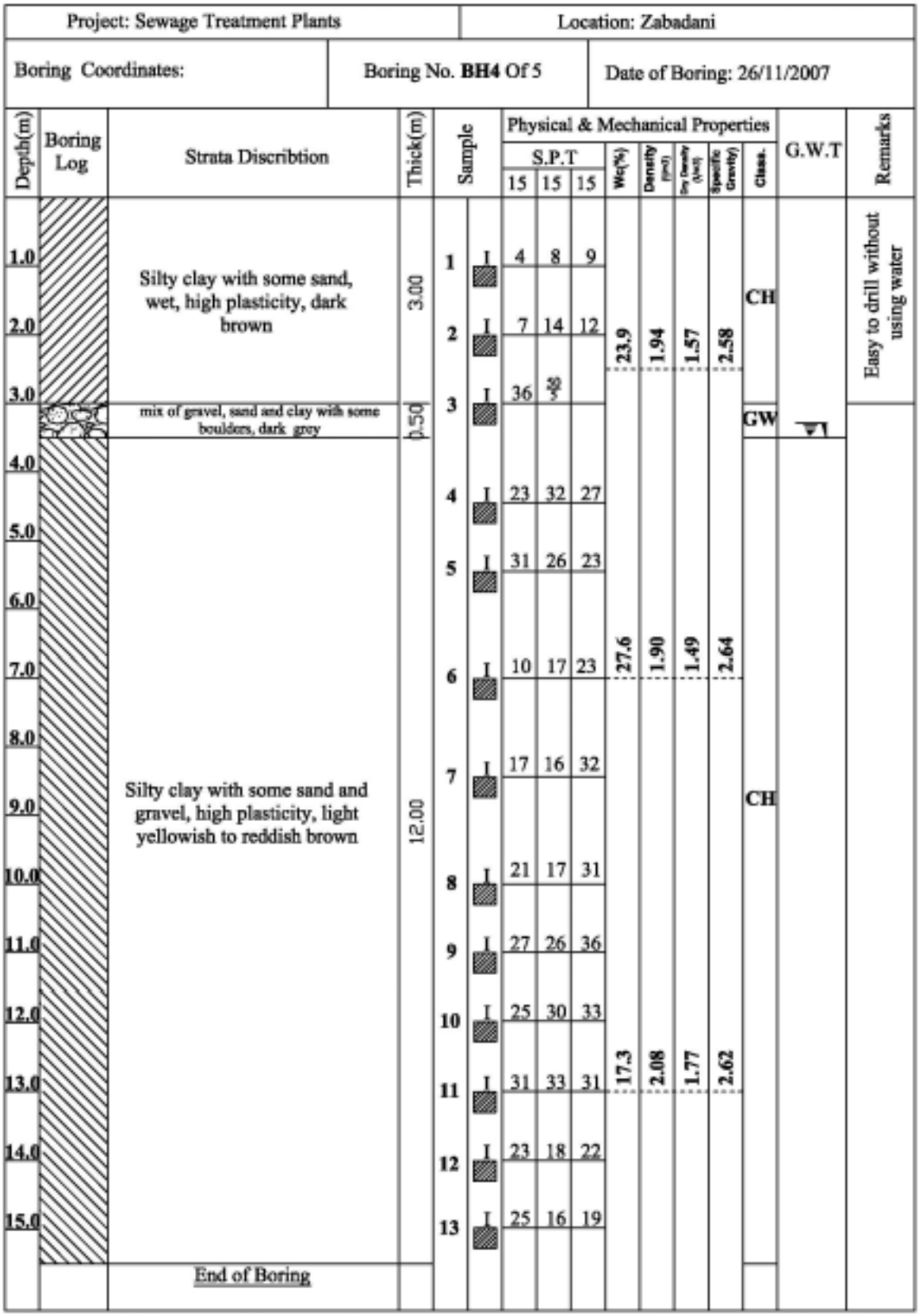
(3) Result of BH NO.2



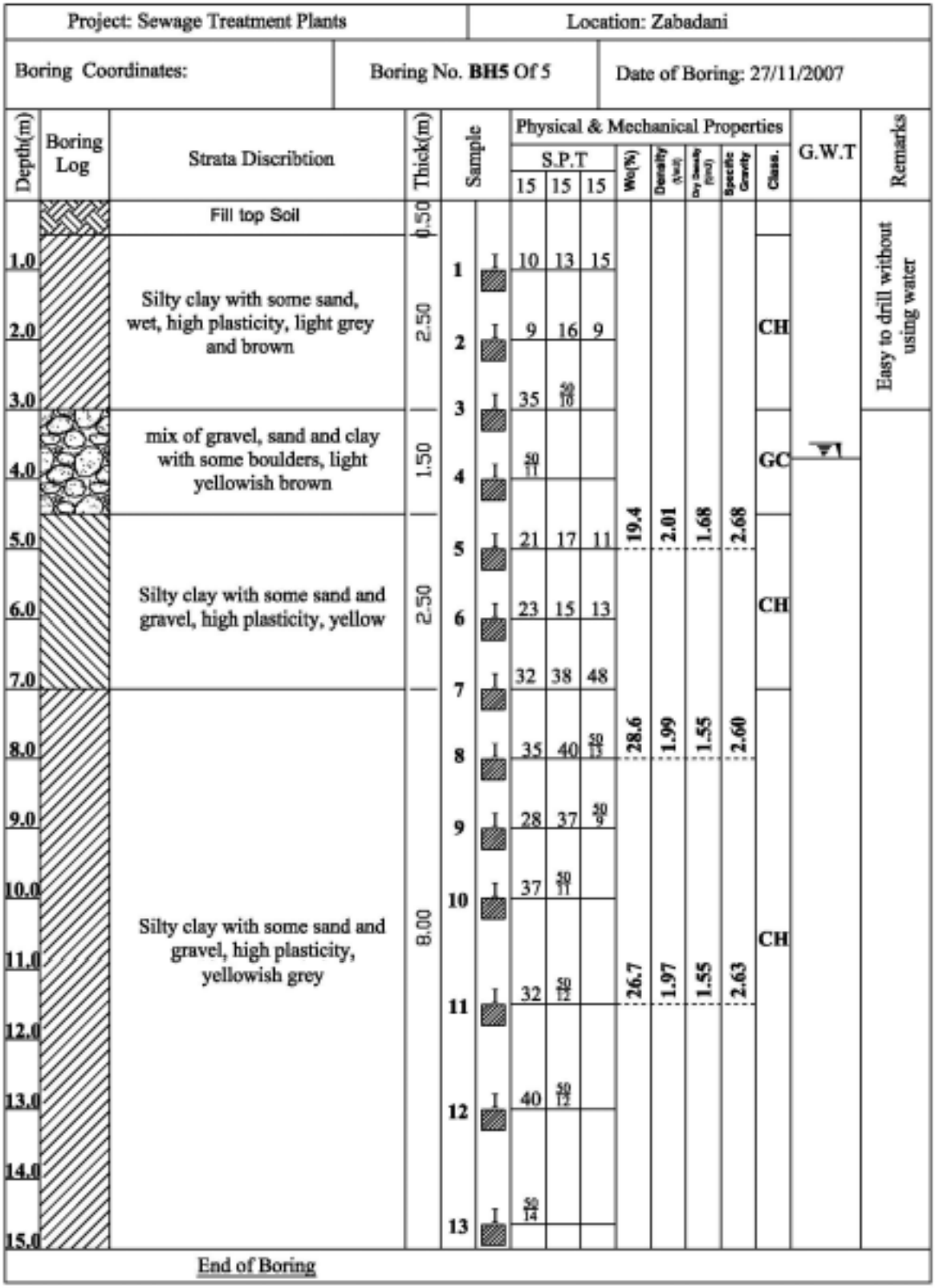
(4) Result of BH NO.3



(5) Result of BH NO.4



(6) Result of BH NO.5



PART IV : MINUTES OF MEETING

Minutes of Meeting

MINUTES OF MEETING
ON
THE INCEPTION REPORT
FOR
THE STUDY
ON
SEWERAGE SYSTEM DEVELOPMENT
IN
THE SYRIAN ARAB REPUBLIC

AGREED UPON BETWEEN
MINISTRY OF HOUSING AND CONSTRUCTION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Damascus, November 6, 2006

Dr. Kamal Al Sheikha
Vice Minister
Ministry of Housing and Construction
The Syrian Arab Republic

Mr. Hirofumi Sano
Team Leader
JICA Study Team

In accordance with the Scope of Work for "The Study on Sewerage System Development in the Syrian Arab Republic" (hereinafter referred to as "the Study") agreed upon between the Ministry of Housing and Construction (hereinafter referred to as "MHC") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on March 15, 2006, JICA dispatched the Study Team (hereinafter referred to as "the Team") headed by Mr. Hirofumi Sano and composed of members from NJS CONSULTANTS CO., LTD. and TOKYO ENGINEERING CONSULTANTS CO., LTD. to Syria. The JICA Advisory Committee has also been dispatched on the commencement of the Study.

The Team submitted 20 copies of the Inception Report (hereinafter referred to as "IC/R") in English. At the first meeting of the Steering Committee, series of explanations were made from the Syrian side and the Team. The following are the main points explained and discussed in the meeting. The list of attendants is attached as **Annex** I .

1. Explanation on Current Situation of the Sewerage System Development in Syria

The Syrian side explained outlines of the current situation and 10th five-year plan's strategies in the area of sewerage system development. The explanation included current issues of the sewerage management and the investment strategy for the sewerage system development in the 10th five-year plan.

2. Explanation on the Agreement of the Study between Japan and Syria

The Syrian side also explained the contents of the agreement of the Study between Japan and Syria, which was concluded on March 15, 2006.

3. Explanation on IC/R

The Team explained the contents of IC/R. The explanation included background and objectives of the Study, study schedule and scope of work for the Study.

4. Open Discussions

Reflecting the above explanations, open discussions were made. The Syrian side pointed out that contamination of the water resources in Syria is so serious that an efficient investment in the sewerage development is crucial. The Syrian side also pointed out that water scarcity is the most critical natural constraint to Syria, and therefore, reuse of treated sewage for agricultural purposes should be actively considered.

2

Annex I

- First meeting of the Steering Committee -

2006.11.6

1. Syrian Arab Republic

NO.	Name	Official Company	Position
1	Mr. Humoud Al Husein	Ministry of Housing & Construction (MHC)	Minister of MHC
2	Dr. kamal Shickha	Ditto	Vice Minister of MHC
3	Mazen Allaham	Ditto	Director of Planning
4	Wasim Fallouh	Ditto	Director of the Project
5	Mohamad Algaendat	Ditto	Director of sewage
6	Feryal Alrifa'i	Ditto	International Relation
7	Ghassan Tarboush	Ditto	Team member
8	Marwan Fallaha	Ditto	Manager assistant
9	Maher Alkhateb	Ditto	Director of Stations department
10	Mohamed Shayah	Ditto	Director of drinking water department
11	Mufak Khalouf	Ditto	General manager of Damascus water Department
12	Abud Almaser Saad Aldin	Ditto	General manager of Damascus countryside water Department
13	Maysaa Alnwas	State planning commission	Director of the complete administration of water resources
14	Mohamad Hakoon	Ministry of agriculture	Director of sewage researches department
15	Atef Deeb	Ministry of Irrigation	Director of water quality monitoring
16	Samar Alshami	GCEA	Engineer
17	Sawsan Arafeh	GCEA	Engineer- assistant of director of water safety department
18	Ez Aldin Ibrahim	Al Hasake	Engineer –member of the executive bureau
19	Ahmad Saleh Al Ali	Al Rakka water establishment	Director of maintenance and investment department
20	Omar Alhusin	Al Rakka water establishment	Director of studies department
21	Samer Ahmad	Lattakia sewerage company	General manager
22	Imad Khalouf	Tartus services	Engineer
23	Sami Jaber	Sewage company	General manager
24	Tha'er Akhnif	Damascus countryside governorate	Environment director
25	Mazaen Abud Al Kareem	Deir Ezor water establishment	Director of the Sewage department
26	Khalel Saadeya	agriculture department in Damascus countryside	Director of the department
27	Ghassan Alzaghet	General company for studies	Director of the Sewage department
28	Rana Dawod	Alwatan newspaper	Journalist
29	Monzer Mohsen	Television	Journalist
30	Badia Alwanos	Tishreen newspaper	Journalist
31	Nomaan Aslan	AlBath newspaper	Journalist

3

2. Japan

NO.	Name	Official Company	Position
1	Satoshi BABA	Japanese embassy	Second Secretary
	Ghassan Alhabbal	Ditto	Engineer
2	Kazuhide NAGASAWA	JICA Syria Office	Resident Representative
3	Yumiko HONDA	JICA Syria Office	Project Formulation Advisor
4	Kiyoshi MASUMOTO	JICA Tokyo	Environmental Management Group Director
5	Eriko TAMURA	JICA Tokyo	Environmental Management Team I
6	Atsuo HURUYAMA	Nihohe City Officer	JICA Advisory Committee Member
7	Mikihito YASUI	JICA Expert	
8	Yoichi IWAI	JICA Study Team	Team Leader of the Capacity Development of Environmental Monitoring
9	Ryunan MATSUE	Ditto	Member of the above project
10	Hirofumi SANO	JICA Study Team	Team Leader of the Study of Sewerage System Development
11	Norihisa TAOKA	Ditto	Member of the above project
12	Takashi WATANABE	Ditto	Member of the above project
13	Toshiaki RUIKE	Ditto	Member of the above project
14	Masahiro KAWACHI	Ditto	Member of the above project

4

THE STUDY
ON
SEWERAGE SYSTEM DEVELOPMENT
IN
THE SYRIAN ARAB REPUBLIC

MINUTES OF MEETING
ON

THE 2ND STEERING COMMITTEE MEETING

Damascus, June 3, 2007

Dr. Kamal Al Sheikha
Vice Minister
Ministry of Housing and Construction
The Syrian Arab Republic

Mr. Hirofumi Sano
Team Leader
JICA Study Team

Minutes of Meeting

The Ministry of Housing and Construction (hereinafter referred to as "MHC"), as the Counterpart Agency for the Study on Sewerage System Development in the Syrian Arab Republic (hereinafter referred to as "the Study"), held the Steering Committee Meeting with the JICA Study Team (hereinafter referred to as "the Study Team") and JICA, on June 3rd 2007. The participants of the meeting are listed in the Attachment.

In March 2007, The Study Team submitted the Progress Report (hereinafter referred to as "PR/R") in English. With opening address of Dr. Kamal, the vice-Minister of MHC, the Study Team explained the following items and major comments from Syrian side are summarized below, respectively.

1) Outline of Progress Report

Although there are few discrepancies, Syrian side approved the contents of PR/R. The Study Team will reflect their comments on PR/R and submit it to MHC.

2) Proposed procedures in preparation of Macro Plan and Master Plan

Further information is needed to prepare 1st stage of Macro Plan, namely Sewerage System Area Map with delineation of areas to be served by On-site System, Decentralized Sewerage System and Centralized Sewerage System. The Study Team will prepare the table listed information needed from each Governorate, respectively. Needed information shall be prepared as soon as possible.

3) Master Plan prioritized Areas

The Study Team shall prepare their opinion and recommendation upon selection of prioritized areas in seven Governorates.

Table of Attendants List

Name of Meeting : 2nd Steering Committee Meeting
Date : 3 June, 2007
Venue : Meeting Room of MHC (Ministry of Housing and Construction)

1. Syrian Arab Republic

No.	Name	Organization	Position
1	Kamal Al Sheikha	MHC	Vice Minister
2	Mohammad Al-Gradatt	MHC	Director of Sewerage
3	Wasim Fallouh	MHC	Project Manager
4	Maher Alkhatib	MHC	STP's Department Chief
5	Bassam Albuqaii	MHC	Dr., Engineer
6	Eyad Ali	MHC	Engineer (Counterpart Member)
7	Thaer Janem	MHC	Engineer (Counterpart Member)
8	Wisal Khalil	MHC	Engineer (Counterpart Member)
9	Aatef Deeb	Ministry of Irrigation	Engineer
10	Muhammad Haffon	Ministry of Agriculture	Sewage Researches Department Chief
11	Ibrahim Issa	Ministry of Industry	Engineer of Minister Consultant's Office
12	Ahmad Alqawi	Ministry of Tourism	Engineer of Tourist Planning Directorate
13	Kameel Rashid	Meteorological General Directorate	Prediction and Meteorological Department Manager
14	Mazen Alkareem	Water Establishment of Dier Ezzor	Sewage Department Chief
15	Izz Allbrahim	Hassakeh Governorate	Executive Council Member
16	Waddah Alujaili	Technical Services Directorate of Raqqa	Topographic Department Chief
17	Imad Khallouf	Technical Services Directorate of Tartous	Sewage Studies Department Chief
18	Thaer Aldeif	Damascus Rural	Director of DFEA
19	Nazeeh Aldin	Water Establishment of Damascus Rural	Sewage Department Chief
20	Jamal Ayyash	Dar'aa Governorate Secretariat	Engineer
21	Fadi Othman	Water Establishment of Dar'aa	Sewage Department Chief
22	Samer Ahmad	Sewage Company of Lattakia	General Manager
23	Salem Muheisen	GCBC of Homs	Engineer

2. Japan

No.	Name	Organization	Position
1	Hirofumi Sano	JICA Study Team	Team Leader
2	Takashi Watanabe	JICA Study Team	Sewage Planning
3	Toshiaki Ruike	JICA Study Team	Planning of STP
4	Nagham Salman	JICA Study Team	Translator
5	Amal Hasan	JICA Study Team	Translator
6	Muthanna Hamzawi	JICA Study Team	Translator
7	Yousuke Tamahayashi	JICA Syria Office	Deputy Resident Representative
8	Yumiko Honda	JICA Syria Office	Project Formulation Advisor
9	Nawras Khaled	JICA Syria Office	Programme Officer
10	Satoshi Baba	Embassy of Japan	Economic Cooperation
11	Ghassan Habbal	Embassy of Japan	Economic Assistant

THE STUDY
ON
SEWERAGE SYSTEM DEVELOPMENT
IN
THE SYRIAN ARAB REPUBLIC

MINUTES OF MEETING
ON

THE 4th STEERING COMMITTEE MEETING

Damascus, December 11, 2007

Mr. Mohammed Alfaradat
Sewerage Director
Ministry of Housing and Construction

Mr. Hirofumi Sano
Team Leader
JICA Study Team

Dr. Kamal Al Sheikha
Vice Minister
Ministry of Housing and Construction
The Syrian Arab Republic

Ms. Hiroko Kamata
JICA Advisory Committee

Minutes of Meeting

The Ministry of Housing and Construction (hereinafter referred to as "MHC"), as the Counterpart Agency for the Study on Sewerage System Development in the Syrian Arab Republic (hereinafter referred to as "the Study"), held the Steering Committee Meeting with the JICA Study Team (hereinafter referred to as "the Study Team") and JICA, on December 11th 2007. The participants of the meeting are listed in the Attachment.

In December 11 2007, The Study Team submitted the Draft Final Report (hereinafter referred to as "DF/R") in English to MHC. With opening address of Mohammed Aljaradat, the Sewerage Director, the Study Team explained the contents of DF/R.

1. Comments on Draft Final Report

Syrian side will submit their comments on DF/R to the Study Team through JICA by 31st January 2008.
The Study Team will reflect their comments on Final Report and submit it to MHC through JICA.
The biggest concern of MHC is "Master Plan Map covering whole Seven Governorates".
The Study Team proposed the preparation of the Map shows STP locations to be constructed until 2025, the target year of Master Plan, in target Governorates with the following conditions:

- Cities where sewer network have been developed already.
- Cities supposed to have larger pollution load, namely large population and large-scaled factories, have adverse impact on sensitive areas, and so on.
- STPs should be submitted in priority order, to be as a basis for national action plan for sewerage sector development.

Evaluation of existing regional studies as it is mentioned in the Scope of Work should be submitted.

2. Publication of the Final Report

Syrian side shall make the Final Report accessible to the public to ensure its maximum utilization.

Attachment
Table of Attendance List

Attendants Sheet of Meeting

:Meeting Name 4th Steering Committee
:Date December, 2007 11
:Venue Meeting Room of Ministry of Housing and Construction

No	Name	Organization	Position
1	Hirofumi Sano	JICA Study Team	Team Leader
2	Takashi Watanabe	JICA Study Team	Sewage planning
3	Atsushi Toyama	JICA Study Team	Cost estimation
4	Seiichi Hanafusa	JICA Study Team	Sewage Facility
5	Victor Kupriyanov	JICA Study Team	Economist
6	Toshiaki Ruike	JICA Study Team	STP Planning
7	Nawras Khaled	JICA Office	Programme Officer
8	Mayami Morakami	JICA Office	ARR
9	Furuyama Atsue	Advicory Committee for the	Advicor
10	Hiroko Kamata	Advicory Committee for the study	Advicor
11	Eriko Tamura	JICA HQs	Senoir Officer
12	Satishi Baba	EOJ	Second secretary
13	Adnan Al Habal	EOJ	Assistant
14	Amal Hasan	JICA Study Team	Interpriter
15	Louay Khalil	JICA Study Team	Engineer
16	Yaser Hamida	JICA Study Team	Engineer
17	Ayman Romieh	JICA Study Team	Interpriter
18	Thaer Janem	MHC	C/P
19	Ghassan Altarbouh	MHC	C/P
20	Wisal Khalil	MHC	C/P
21	Iyad Ali	MHC	C/P
22	Maher Alkhatib	MHC	C/P
23	Wasim Falluh	MHC	Project manager
24	Waddah AlJ"jaili	Technical Services at Alraqqa	Topographic Department Chef
25	Izz Aldin Ibrahim	Alhasakeh Governorate	Executive council member
26	Fares Othman	Dara'a Water Establishment	Sewage Department Chef
27	Muhammed Aljaradat	MHC	Sewage manager
28	Ahmad Alqawi	Ministry of tourism	Engineer
29	Imad Khalkouf	Technical Services at Tartus	Engineer
30	Ibrahim Issa	Ministry Of Industry	Training Directorate

Attendants Sheet of Meeting

:Meeting Name 4th Steering Committee
:Date December, 2007 11
:Venue Meeting Room of Ministry of Housing and Construction

.No	Name	Organization	Position
31	Hasan Lahham	MHC	C/P
32	Abir Mohamed	MHC	Sewage Directorate
33	Mazin Abid Karim	Dier ez Zor Water Establishment	Sewage Department Chef
34	Nazih Sharuf Addin	Rural Damascus Water Establishment	Sewage Department Chef
35	Mohamed Hakkoun	Agriculture Research Commissio	Sewage Research Department Chef
36	Mayada Kodmani	Ministry of Irrigation	General Commission of water
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