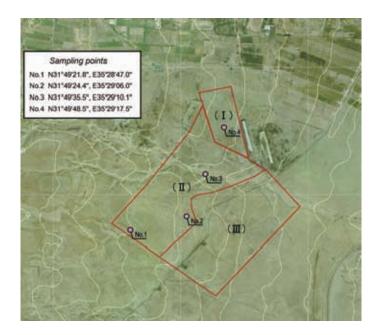
III-2 Soil sampling test

Report for soil sampling test

A- SAMPLING LOCATIONS:

Samples were collected at shallow depths upon your request in four different locations within the proposed project area. Sampling locations are shown on the attached figure.



D:\HCL\Soil Report\Agro Indust. Park Jericho\Report.doc

Page 1 of 3



B- TESTS CARRIED OUT:

Upon your request, the following tests were carried out, all in accordance with British Standard (BS 1377):

- 1- Natural moisture content.
- 2- **Grain size distribution (sieve analysis)**. Standard sieves were used to perform the sieve analysis tests on material after washing on sieve No.200.
- 3- **Atterberg limits (Liquid and Plastic)**. Liquid and plastic limits tests were conducted on soil samples and the plasticity index (PI) was determined.
- 4- Specific gravity of solid particles test
- 5- Moisture-density relation (Modified compaction test)
- 6- **Direct shear test**, where three identical (remolded) specimens were sheared under three vertical load conditions and the maximum shear stress in each case was measured. The strength parameters, namely cohesion (c) and angle of internal friction (Ø) were determined from the maximum shear-vs- normal stress plot.
- 7- **PH value test** in accordance with BS 1377: Part 3: 1990.

Sample No.	Visual Description
1	Light brown fine grained cohesive
1	non- organic silt
2	Light brown fine grained cohesive
2	non-organic silt
	Grayish fine grained cohesive
3	laminations of silty non-organic
	formation
	Grayish fine grained cohesive
4	laminations of silty non-organic
	formation

C- SAMPLE DESCRIPTION:

D- TEST RESULTS:

The results of the carried out tests are summarized in the tables below:



D-1 Gradation:

Sieve	Sieve Size	Percent Passing							
No.	(mm)	Sample 1	Sample 2	Sample 3	Sample 4				
No. 3/8"	9.50	100	-	-	-				
No.4	4.75	98.8	100	-	100				
No.10	2.00	97.1	99.3	-	99.7				
No.16	1.18	95.5	96.7	100	99.4				
No.30	0.600	92.4	93.1	99.1	99.1				
No.40	0.425	90.2	91.5	98.7	97.1				
No.50	0.300	88.6	90.5	98.6	94.9				
No.100	0.150	84.8	87.5	98.1	91.4				
No.200	0.075	80.8	85.5	97.6	89.8				

D-2 COMPCTION TEST (Moisture density relation):

Sample No.	Optimum Moisture Content (OMC) (%)	Maximum Dry Density (MDD) (g/cm ³)
1	13.7	1.901
2	18.7	1.744
3	30.7	1.423
4	13.5	1.583

D-3 OTHER TESTS:

No.	Moisture Content			Atterberg Limits		in v	Direct Shear Parameters		
Sample		PH value	Liquid limit	Plastic limit	Plasticity Plasticity Index		С	Ø	
Š	(%)		(%)	(%)	THUEX		(KN/m²)	(°)	
1	8.1	7-8	29.1	19.0	10.1	2.542	12	14	
2	3.6	7-8	34.7	23.0	11.7	2.450	13	12	
3	5.5	7-8	49.0	35.4	13.6	2.501	15	15	
4	2.6	7-8	39.3	26.4	12.9	2.459	14	13	

Finally, we thank you for your confidence in our laboratory and look forward for further cooperation with your team. For further information or clarification regarding this report, please contact us.

Yours sincerely,

Dr. Sami A. Hijjawi General Manager

III-3 Geological investigation

Report on geological investigation



GEOLOGICAL SURVEY

FOR THE AGRO INDUSTRIAL PARK

DEVELOPMENT IN

THE JORDAN RIVER RIFT VALLEY



Prepared for: JICA STUDY TEAM/ KRI INTERNATIONAL CORP.

Prepared by: HIJJAWI CONSTRUCTION LABS

JULY - 2008



M-S/ JICA Study Team Jericho Ref. : SI/269A Date : 16/8/2008

Mr. Munenori TADA Team Leader KRI International Corp.

Project – The Feasibility Study on Agro Industrial Park Development in The Jordan River Rift Valley Subject – Geological Survey – Final Report

Dear Mr. TADA,

With reference to the signed Contract on June 5th, 2008 between **KRI International Corp.** and **Hijjawi Construction Labs**, we are pleased to submit this report with findings and results of tests carried out for the above mentioned project.

We look forward for further cooperation and would like to take this opportunity to highly considerate your confidence in our laboratories. For any clarification concerning this report, please contact us at your convenience.

Yours sincerely,

Dr. Sami A. Hijjawi General Manager



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1. INTRODUCTION

1.1 GENERAL

This report presents the outcome of the geological survey carried out for the proposed construction site of the Agro Industrial Park Development in The Jordan River Rift Valley (south east of Jericho).

1.2 PURPOSE AND SCOPE

Investigation of the underground conditions at a site is prerequisite to the economical design of the substructure elements. It is also necessary to obtain sufficient information for feasibility and economic studies for any project.

For this particular project, and due to the type of proposed structures, which highly depend on the nature of soils, the site investigation becomes of special importance to obtain sufficient information about the geotechnical parameters of the ground. In general, **the scope of this site investigation** was to provide the following:

- Core drilling for bedrock, soil and gravel deposits
- Standard Penetration Tests (SPT) at every 1.5m interval in each borehole
- Preparation of investigation report with borehole logs, SPT results, photos and all data related to the works and findings
- Preparation of geological map consisting of geological plan and two geological cross sections.

This was accomplished through the close cooperation of **HCL**'s geotechnical engineer and the technical staff of its Geotechnical Department.



2. FIELD EXPLORATION AND TESTING

2.1 DRILLING

2.1.1 The geotechnical investigation program agreed upon with **Hijjawi Construction Labs** to explore the subsurface conditions included the drilling of five boreholes at the proposed site to a depth of 20m each.

The test borings were located in the field by JICA Study Team representative by measuring relative to the property corners and other identifiable landmarks using the provided site plan. The locations of the test borings are shown on the Boring Location Map. Soil logs for the test borings shown on the Boring Location Plans are presented in Appendix of this report.

2.2 SAMPLING

Samples were collected continuously within the drilled depths upon your request in all boring locations within the proposed project area. Sampling locations are shown on the attached figure.

According to the drilling requirements set in the agreement, continuous coring was carried out. For this purpose:

- double tube core barrel was used in rock formations (ASTM D2113),
- thin wall tubes were used for sampling of cohesive undisturbed relatively cohesive soil formations (ASTM D1587),
- split spoon samplers with accessories were used for SPT testing and sampling (ASTM D1586).



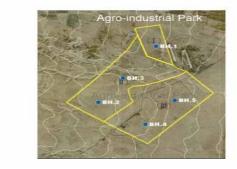


Fig. 1 Approximate locations of boreholes

Borehole	Location coordinates	Elevation					
No.	Location coordinates	From	То				
1	N 31 deg 49.808', E 35 deg 29.292'	-299.3	-319.3				
2	N 31 deg 49.398', E35 deg 28.906'	-293.8	-313.8				
3	N 31 deg 49.568', E 35 deg 29.049'	-294.5	-314.5				
4	N 31 deg 49.246', E 35 deg 29.209'	-300.8	-320.8				
5	N 31 deg 49.403', E 35 deg 29.395'	-307.5	-327.5				

Soil samples were obtained from the test borings and placed in core boxes and delivered to JICA Field Office in Jericho. The soils observed during logging of the test borings were classified according to the Unified Soils Classification System (USCS), utilizing field classification procedures outlined in ASTM D 2488.

Hijjawi Construction Labs



Sample in the split spoon



View of samples in the core box

The borings were advanced using a truck mounted, Mobile B-31 drilling rig. Standard Penetration Tests were performed, and representative samples were collected in accordance with ASTM D 1586 sampling procedures.

Depths referred to in this report are relative to the existing ground surface elevations at the time of our field investigation. The surface and subsurface conditions described in this report are as observed at the site at the time of our field investigation. <u>Photos for core boxes with samples are attached to this report</u>.

2.3 SAMPLING RECOVERY

Samples were collected from the whole strata within the depth of boreholes. It can be said that the sampling recovery was around 100% in all boreholes. Due to the dry and un-cemented nature of materials encountered, samples were loosened (collapsed) in most cases while extruding from the sampling devices.

2.4 FIELD TESTING – STANDARD PENETRATION TEST (SPT)

The Standard Penetration Test (SPT) was carried out in all boreholes (wherever applicable) at 1.5m interval as required. The test was carried out by means of the 50.8 mm outside diameter split - spoon sampler, which was driven to penetration of 450 mm by repeated blows of a 63.5 Kg monkey falling through 760 mm. The number of blows for the last 300-mm of driving was recorded as the standard penetration number (N-value).

The records from the SPT are given in the borehole logs.



3. GENERAL GEOLOGY OF THE SITE

3.1 JERICHO GENERAL GEOLOGY

The geology of Jericho district is characterized by the Jordan rift valley deposits which are mainly composed of Marl & Pleistocene Alluvial formations [Environmental; Profile for the West Bank – Jericho District Profile – ARIJ Institute, 1995]. The geologic formations in the eastern part of Jericho district are:

I. Alluvium Formation:

This formation covers the area adjacent to the Jordan Valley starting by a width of 1 km in the north and 5 kms in the south. It is of the Pleistocene to Recent in age. It is bounded structurally by the Jordan rift regional fault in the east and another fault of 12 km long in the west.

II. Lisan & Samra Formation:

This formation covers the greatest part of the Jericho district. It is of the Pleistocene to Recent age, and includes three local faults of up to 3 kms long. This area is bounded by the alluvium formation in the east and by a greater fault of about 13 kms long in the west. It is mainly composed of marl, chalk and conglomerates.

3.2 SOILS

The Jordan Valley is the only eco-geological system in Jericho district. Nine soil associations can be distinguished in this system:

3.2.1. Alluvial Arid Brown Soils

This type of soil association is located mainly in the Jericho city and Al-Auja areas. It covers an area of about 6,470 hectares. It is exists of alluvial fans and plains, formed as a result of erosion of calcareous silty and clayey materials. This soil type supports



Herbaceous vegetation of desert annual halophytes and glycophytes and responds well to irrigation, producing various crops, mainly subtropical and tropical fruits, such as citrus, bananas, and dates, as well as winter vegetables.

3.2.2. Loessial Arid Brown Soils

This type of soil association is found on moderate slopes to the west and northwest of the Jericho district, covering an area of about 1,290 hectares. The soil is formed originally from conglomerate and/or chalk and mainly found on gently sloping plateaux as well as dissected plateaux with locally hilly topography. The major vegetation type found in this region is Achillea santolina, and the main current land use consists of various field crops and some horticultural crops planted as irrigated crops. Wheat, barely, and sorghum are also grown under rainfed conditions.

3.2.3. Reg Soils and Coarse Desert Alluvium

This type of soil association is located in the southern part of the Jericho district. It is found in plains and dissected low plateaux and characterize large valleys and alluvial fans. The soil covers an area of approximately 800 hectares and it's parent materials are mainly of unconsolidated mixed stone and deposits. The vegetation on this soil is restricted in a few areas to rivulets. In most areas dwarf shrubs such as Anabasis articulata and Reaumuria are dominant. This soil is almost of no agricultural value and its native vegetation poor pastures for camels, goats and sheep.

3.2.4. Brown Lithosols and Loessial Serozems

This type of soil association is found on steep to moderate mountain slopes, in the areas southwest of Aqbat Jaber Camp and northwest of Nuwe'ma, covering an area of about 4,670 hectares. The soil is originally formed from limestone, chalk, dolomite and flint.

The major vegetation types found on this soil are Anabasis articulata and Zygophyllum.

The current land use is restricted to winter crops grown by Bedouins in some wadis.



3.2.5. Calcareous Serozems

This type of soil association is found southeast of Jericho city, northeast of Nuwe'ma and east of Al-Auja villages. It is formed mainly as a result of the flooding of the Jordan River. This soil covers an area of about 2,400 hectares and is originally formed from limestone, chalk and marl. The vegetation it hosts is restricted to Salsola vermiculata var vilosa and its current land use is limited to winter grazing.

3.2.6. Solonchalks

This type of soil association is found in the south eastern part of the district. It covers an area of approximately 3,460 hectares. The soil occupies the drainage valleys and closed basins in the district, where the groundwater table is near the soil surface. The soil parent rocks are recent alluvial deposits ranging in texture form sand to clay. Its major vegetation cover is halophytic with species of Tamarix, Suaeda, and Nitraria being dominant. Without proper drainage this soil is of almost no agricultural value. In the Jericho district some dates are grown on the periphery of the depressions, where the ground water is still relatively fresh.

3.2.7. Loessial Serozems

This type of soil association dominates the areas of Nuwe'ma, north of Al-Auja and south of Aqbat Jaber camp covering an area of approximately 4,920 hectares. This soil is typical of plateaux and moderate slopes. The soil parent materials are loessial sediments, gravel and highly calcareous loamy sediments. Its major vegetation cover is an association of the Hammada scoparia. Most of the area covered by this soil is used for grazing and only part of it is dry-farmed. There are also some irrigated orchards.

3.2.8. Regosols

This type of soil association characterize the eastern border of the Jericho district. It is found as badlands along terrace escarpments in the Jordan Valley, covering an area of approximately 8,880 hectares. The soil parent materials are sand, clay and



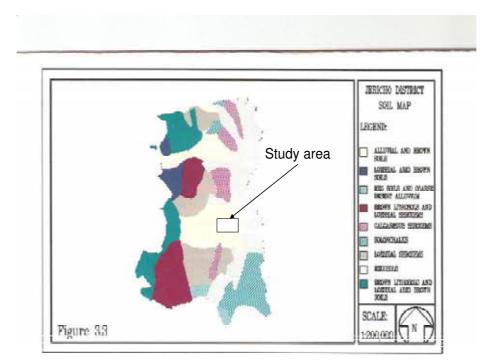
loess. The soil dominant vegetation cover are Anabasis articulata, Salsola vermiculata and Salsola tetrandra, and are used primarily for grazing.

3.2.9. Brown Lithosols and Loessial Arid Brown Soils

This type of soil association characterizes the western part and covers an area of approximately 2,410 hectares of the Jericho district. These type of soils are mainly found on steep rocky and eroded slopes. Brown lithosols are found in the pockets among the rocks, while Loessial arid brown soils are found on flat hilltops, plateaux and foot-slopes.

The parent rocks of this soil association are chalk, marl, limestone and conglomerates. Its major vegetation cover is Artemisia herba-alba.

The given below Jericho District Soil Map illustrates the described soil groups (taken from Reference No. 1 – Environmental Profile for the West Bank – Jericho District Profile – ARIJ Institute, 1995 – Fig.3.3).





3.3 SITE GENERAL GEOLOGY

Considering the collected samples from the drilled five boreholes within the borders of the proposed site, and reviewing the visual analysis and description given in the borehole logs, it can be concluded that the whole studied area (within the explored depth of 20m from the existing ground) consists of <u>un-cemented alluvium</u>, loose to medium dense, fine grained silts to sandy silts with occasional cemented particles in a form of gravels.

The encountered materials in the drilled boreholes, as described above, can be referred to the soil description given in §3.2.1 above (Alluvial Arid Brown Soils).

<u>Geological cross sections</u> illustrating the subsurface conditions encountered in the drilled boreholes are given in the Appendix to this report.

4. REFERENCES

- Environmental Profile for the West Bank Jericho District Profile ARIJ Institute, 1995.
- Earth Manual, Part 1 (3rd ed.). US Department of the Interior Bureau of Reclamation, 1998.



5. APPENDICES

Project	Agro	Industrial F	Park De	evelopment		Locatio	n	Jerie	cho	
Borehole No.	1	Page I	No.	1/2	Date	28-6-20	08	•		
Ground level	-299.	3			Weather	Sunny				
Drill Rig	Mobi	e B-31			Operator	Sharif				
Scale	<u></u>							S	PT	
(m)	Sam- pler Type	Sample recovery	De	escription	of soil strata	USCS	()	lo. of	blow	s)
	0 - F						15	15	15	Ν
-299.3										
-300.3							8	4	5	9
-301.3										
							5	5	7	12
-302.3									-	
							<u> </u>			
-303.3							10	10	9	10
-303.3			l In-	cemented,		10	10	У	19	
2012		100%			grained silty	ML				
-304.3					ation					
							7	8	10	18
-305.3										
-306.3	/						9	13	15	28
-307.3										
							9	11	12	23
-308.3										
-309.3				End of bori	ng @ -309.3					
I		1	1	Water Re	-	L	1	1	1	1
Level, at whicl	h water v	was encou	ntere	d	None	Color of w	ater	-		
Water level 24						None				
Remarks :										
USCS – Unified			stem							
R – Refusal (mo	ore than 5	u blows)								
SPT (Split spoo	n sampler)								
	harrel can	onling								
	barrel san	ihiind								
Approved	D- 6	Sami A Lii								
Approved :	Dr. 8	Sami A. Hij	jawi							

Project	Agro 1	Industrial F	ark D	evelopmer	ıt	Locatio	n	Jeri	cho	
Borehole No.	1	Page I		2/2	Date	29-6-20	08			
Ground level	-299.3	3			Weather	Sunny				
Drill Rig	Mobile	e B-31			Operator	Sharif				
Scale 🛓	er	Comulo							PT	
(m) Scale	pler Type	Sample recovery	D	escription	of soil strata	USCS			blow	
		-					15	15	15	N
-309.3							13	18	19	37
-310.3										
			مال	comontod	madium danca		12	18	17	35
-311.3		100%			, medium dense t, brownish, fine					
		100 /0			Ity formation					
-312.3				5	,		15	17	18	35
-313.3										
							18	25	34	59
-314.3										
-315.3							25	28	39	67
-316.3					dense, medium					
		100%	mo		ish, fine grained	ML	28	30	35	65
-317.3				Silly I	ormation					
-318.3							30	30	37	67
-319.3				End of bor	ing @ -319.3					
				Water	-	I	1	L	1	1
Level, at which	water	was enco	ounte		None	Color of w	ater	-		
Water level 24h						None				
Remarks :										
USCS – Unified S			Systen	n						
R – Refusal (more	e than	50 DIOWS)								
SPT (S	plit spo	on sample	r)							
Core ba	arrel sa	ampling								
 				I						
Approved :	Dr. S	ami A. Hij	jawi							

Project	Agro	Industrial F	ark Development		Locatio	n	Jericho		
Borehole No.	2	Page	No. 1/2	Date	2-7-200	8			
Ground level	-293	.8		Weather	Sunny				
Drill Rig	Mobi	le B-31		Operator	Sharif				
Scale	5 x 8	Sample						PT	_
(m) (sam- pler Type	recovery	Description	of soil strata	USCS		lo. of		
-293.8						15	15	15	N
-295.0									
-294.8		-				4	6	8	14
-234.0						4	0	0	14
-295.8									
-295.0		-				6	8	11	19
-296.8		-				0	0	11	19
250.0									
-297.8		-				5	8	12	20
257.0				low dense, dry,			0	12	20
-298.8		100%		ne grained silty little cemented					
			silts in a form of small pebbles			6	9	12	21
-299.8					0		12	21	
-300.8		-				9	11	14	25
	-	-							
-301.8									
						10	13	17	30
-302.8									
-303.8			End of bori	ng @ -303.8					
			Water F	Record					
Level, at whic				None	Color of w	ater	-		
Water level 24	4hrs. af	fter comple	etion		None				
Remarks :									
USCS – Unified	l Soil Cla	ssification 9	System						
R – Refusal (m			ystem						
· · · · ·									
SPT ((Split sp	oon sample	r)						
	harrel c	ampling							
	Surrer S	amping							
Approved :	Dr. S	Sami A. Hij	jawi						

Project	Agro	Industrial F	Park Development		Locatio	n	Jeri	cho	
Borehole N	o. 2	Page	No. 2/2	Date	3-7-200	8			
Ground lev	el -293	.8		Weather	Sunny				
Drill Rig	Mobi	le B-31		Operator	Sharif				
Scale	5 2 2	Sample		.				PT	
(m)	Sam- pler Type	recovery	Description of	soil strata	USCS	(N 15	10. of 15	blow	-
-303.8						11	14	18	N 32
		_					10	52	
-304.8									
		-				10	14	19	33
-305.8		_							
-306.8		-	Un-cemented, medium			9	16	20	36
		100%	brown, fine grained sill		^N ML				
-307.8			little cemented silts in pebble						
		-	ревые	5		13	17	22	39
-308.8		-							
-309.8		-			12	17	23	40	
-310.8									
						17	21	37	58
-311.8			Cemented, dense, n	adium maist					
		100%	brownish, fine grained		ML				
-312.8		_	, 5	,		20	40	>50	R
212.0									
-313.8			End of boring						
	hieh		Water Rec		Coloriof	a ter:	T		
Level, at w Water leve				None	Color of w	ater	-		
Remarks :	i 241115. d	iter comple	euon		None				
Remarks									
USCS - Unit			System						
R – Refusal	(more thar	1 50 blows)							
S	PT (Split sp	oon sample	r)						
	ore barrel s	ampling							
Approved :	Dr. S	Sami A. Hij	jawi						

Borehole No. Ground level Drill Rig	3 -294.5 Mobile B	Page N		1/2	Date Weather Operator	30-6-20 Sunny Sharif	08	·			
Drill Rig Scale ב של (m) ניס ב	Mobile B	Sample	Desc								
Scale ta a (m) Scale		Sample	Desc		Operator						
Scale ta a (m) Scale		Sample	Desc				Sharif				
			Desc	· · · ·	· ·			SPT			
				ription of a	Description of soil strata			(No. of blows)			
-294.5							15	15	15	Ν	
	_										
-295.5							2	3	4	7	
-296.5							4	5	7	12	
-297.5							-				
-298.5			n-ceme	nted low d	dense, dry, light		4	6	9	15	
-299.5		100%			silty formation	ML	5	5	8	13	
-300.5											
-301.5							7	8	10	18	
-302.5							6	8	9	17	
-303.5							0	0			
-304.5			Enc	d of boring	@ -304.5						
	I			Vater Rec		I	1	1	1	1	
Level, at which w	water w	as enco			None	Color of w	ater	-			
Water level 24h						None		1			
Remarks :											
USCS – Unified Sc	oil Classif	ication S	vstem								
R – Refusal (more			,								
SPT (Sp	lit spoon	sampler)								
Core ba	rrel sam	pling									
Approved :	Dr. San	ni A. Hijj	jawi								

Project		Agro	Industrial P	ark Developme	ent	Location Jericl					
Borehole No.		3	Page I	No. 2/2		Date	1-7-200	8			
Ground level		-294.	5			Weather	Sunny				
Drill Rig		Mobil	e B-31			Operator	Sharif				
Scale	Ę	r e	Sample							PT	
(m)	San.	pler Type	recovery	Descriptio	on o	of soil strata	USCS		lo. of		1
-304.5								15 8	15 10	15 11	N 21
-304.3	/	_						0	10	11	21
-305.5											
	/							8	9	11	20
-306.5			100%	light brown,	fine	ow dense, dry e grained silty Ition					
-307.5				101	iiiia			8	12	14	26
-308.5											
	/				12	14	21	35			
-309.5											
-310.5								20	20	25	45
-311.5			100%		Cemented, dense, medium moist, brownish, fine grained			22	25	27	52
-312.5	_			silty	forr	mation			25	27	52
-313.5	/							25	27	28	55
214.5											
-314.5						g @ -314.5					
				Water							
Level, at whi						None	Color of w	ater	-		
Water level 2	24h	rs. af	ter comple	tion			None				
Remarks : USCS – Unified R – Refusal (m				ystem							
			,								
		-	on sampler)							
Core	e ba	irrel sa	ampling								
Annuound		Dr. 0		iawi							
Approved :	proved : Dr. Sami A. Hijjawi										

Project	Agro	Industrial P	ark Development	Locatio	Location			Jericho			
Borehole No.	4	Page l	No. 1/2	Date	18-7-20	18-7-2008					
Ground level	-300.	8		Sunny	Sunny						
Drill Rig	Mobi	e B-31		Operator	Adnan						
Scale 🛓	r 9	Sample						PT			
(m) s	pler Type	recovery	Description	USCS		lo. of					
-300.8						15	15	15	N		
-301.8						10	10	13	23		
501.0						10	10	15	25		
-302.8											
502.0						11	13	15	28		
-303.8			Un-cemented,	medium dense	-		15	15	20		
505.0		100%		ne grained silty							
-304.8		100%		ion with little	IIL	12	12	16	28		
	_		peb	bles		12	12	10	20		
-305.8											
					14	14	19	33			
-306.8	-							33			
-307.8					20	25	25	50			
							_				
-308.8			Un-cemented,	modium donco							
		100%	dry, grayish, sa		22	25	27	52			
-309.8			little	_							
-310.8			End of bori	ng @ -310.8							
		1	Water R	Record	I						
Level, at which	wate	r was enco	ountered	None	Color of w	ater	-				
Water level 24	hrs. af	ter comple	etion		None						
Remarks :											
USCS – Unified	Soil Cla	ccification (Netom								
R – Refusal (mo			bystem								
	• • • • •										
SPT (Split spoon sampler)											
	arrola	ampling									
	aners	amping									
Approved :	Dr. S	Sami A. Hij	jawi								

Project	Ag	ro In	dustrial F	ark Developn	nent		Locatio	Location			Jericho			
		4 Pa		No. 2/2 Date		18-7-20	18-7-2008							
Ground level	-30	-300.8WeatherMobile B-31Operator						Sunny						
Drill Rig	Мс	bile I	3-31		Adnan									
Scale	t t t t t t t t t t t t t t t t t t t		Sample Descripti							PT				
(m)	Sam- pler Tyne	recovery		Description of soil strata		USCS	(r 15	No. of	blow					
-310.8		_						25	15 27	27	N 54			
								25	27	27	51			
-311.8														
511.0								30	32	32	64			
-312.8		_						50	52	52	04			
512.0														
-313.8								29	29	33	62			
515.0		_	100%					29	29	55	02			
-314.8			100%											
51110		_		Un-ceme		28	30	35	65					
-315.8		_		grayish, sa	e GP	20	50	55	05					
-316.8								30	30	33	63			
								50	50	55	05			
-317.8														
		-						27	30	35	65			
-318.8														
			100%											
-319.8			100 /0					29	33	35	68			
								25	55	55	00			
-320.8				End of	horiu	na @ -320.8								
		End of boring @ -320.8 Water Record					I	<u> </u>	I	I	L			
Level, at whi	ch wa	ter v	vas enco			None	Color of v	vater	-					
Water level 2						<u>.</u>	None							
Remarks :			•											
			<u> </u>											
USCS – Unifie R – Refusal (n				system										
		an bu	DIOWS)											
SPT (Split spoon sampler)														
	e barre	sam	nlina											
		Juli												
Approved :	Dr	. Sar	ni A. Hij	jawi										

	7.9.01	nuusunai P	ark Developi	ment		Locatio	Jeri	Jericho				
Borehole No.	5	Page I	No.	1/2	Date	19-7-20	19-7-2008					
Ground level	-307.5	5			Weather	Sunny	Sunny					
Drill Rig	Mobile	e B-31			Operator	Adnan						
Scale 🛓	Comolo							PT				
(m) Scale	pler Type	Sample recovery	Desc	ription of	soil strata	USCS			blow			
							15	15	15	Ν		
-307.5												
-308.5							12	10	12	22		
			liebt buss	un aluni fina								
-309.5		100%		slightly pla	, medium dense	² / ML						
				Signey pla			10	13	12	25		
-310.5												
-311.5						8	9	9	18			
-312.5												
					9	9	10	19				
-313.5						_		-				
-314.5		100%		Light brown, medium moist, fine,				9	10	19		
		100 /0	med	SM	8							
-315.5												
							10	10	11	21		
-316.5							10	10	11	21		
510.5												
-317.5			Г	d of bouins								
-517.5				d of boring								
				Vater Red		Color of	-					
Level, at which					None		Color of water -					
Water level 24 Remarks :	irs. aft	er comple				None						
Relliar KS :												
USCS – Unified S	Soil Clas	sification S	System									
R – Refusal (mor			-									
SPT (S	plit spo	on sample	-)									
Core b	arrel sa	mpling										
Approved :	Dr. Sa	ami A. Hij	jawi									

Project		Agro	Industrial P	ark D	evelopme	٦t		Lo	Location			Jericho			
Borehole No	5	Page I	No. 2/2 Date					19-7-2008							
Ground leve	el 🛛	-307.	307.5 Weather						Sunny						
Drill Rig	Mobil	e B-31	Operator					Adnan							
Scale 🛓		r 9	Sample							SPT					
(m)	pler Type	recovery	Description of soil strata				U	SCS		lo. of					
-317.5										15 12	15 12	15 12	N 24		
-318.5				Light brown, medium moist,											
-319.5	/		100%		fine, medium dense sandy silt				SM	10	13	13	26		
-320.5										13	15	18	33		
-321.5															
-322.5	_			Un-cemented, dense, dry, grayish, sandy gravel with little fines					GP	15	15	19	34		
-323.5	_									19	19	23	42		
-324.5			100%					e							
-325.5	/									20	21	23	44		
-326.5	/									22	23	24	47		
-327.5															
521.5					End of bo		ng @ -327.5								
Level, at wh	ich	water		weta		R	None	Color	r of w	ator	-				
Water level							NONE	None							
Remarks :	271						None								
USCS – Unified Soil Classification System R – Refusal (more than 50 blows)															
SPT (Split spoon sampler)															
Cor	Core barrel sampling														
Approved : Dr. Sami A. Hijjawi															

Photo of core sample



Depth 0 – 5 m



Depth 5 – 10 m



Depth 10 – 15 m



Depth 15 – 20 m



Depth 0 – 5 m



Depth 5 – 10 m



Depth 10 – 15 m



Depth 15 – 20 m



Depth 0 – 5 m



Depth 5 – 10 m



Depth 10 – 15 m



Depth 15 – 20 m



Depth 0 – 5 m





Depth 10 – 15 m



Depth 15 – 20 m

Bore Hole No. 5



Depth 0 – 5 m



Depth 5 – 10 m

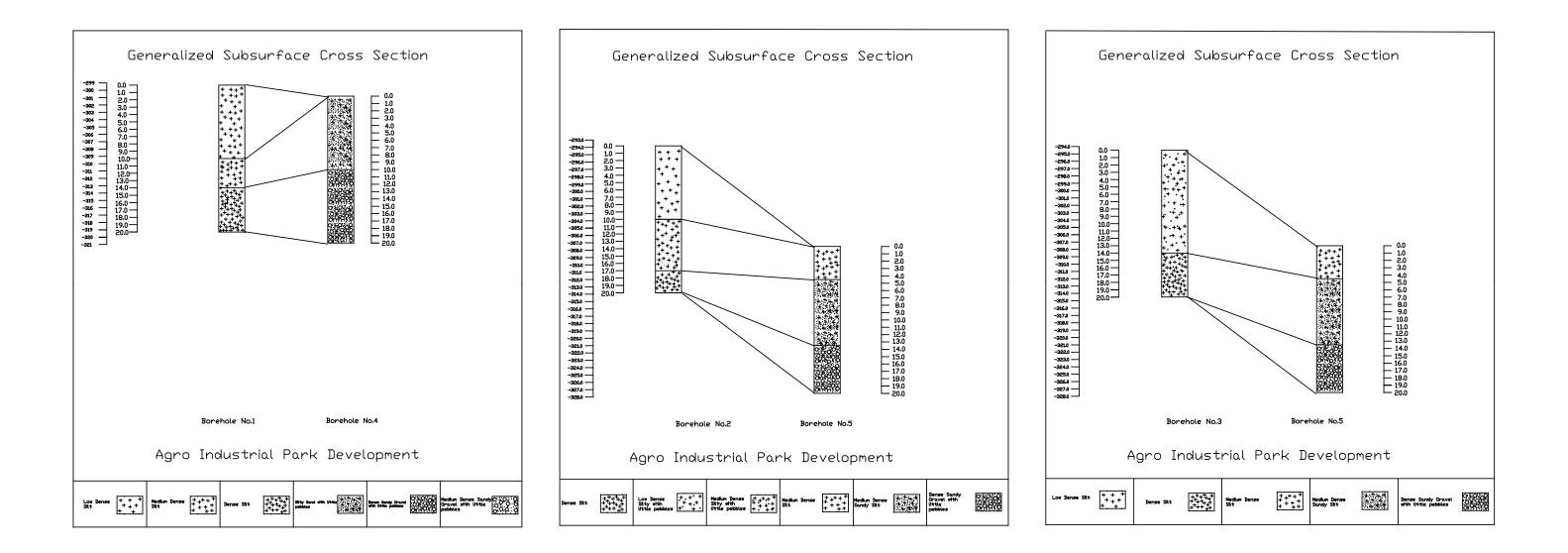
Bore Hole No. 5



Depth 10 – 15 m



Depth 15 – 20 m

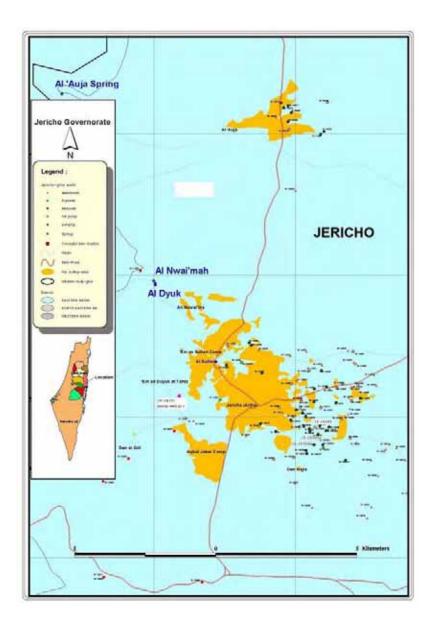


Geological Cross Sections

III-4 Water quality and quantity survey

Report on waster quality and quantity survey

WATER QUALITY AND QUANTITY SURVEY FOR THE FEASIBILITY STUDY ON AGRO-INDUSTRIAL PARK DEVELOPMENT IN THE JORDAN RIVER RIFT VALLEY



October, 2008

KRI International Corp Nippon Koei Co. Ltd

1 INTRODUCTION

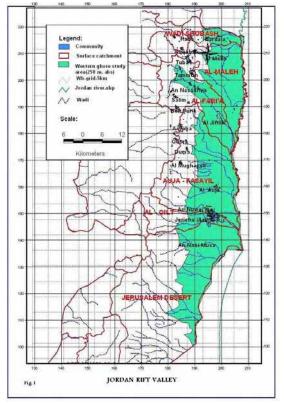
Jericho Governorate is located in the eastern part of the West Bank of the Jordan River Rift Valley and has a population around 24000. The study area is bounded by the Jordan

River from the east and by the mountainous areas from the west. In general, most of the study area characterized by flat areas with little relief ranged from 300 along the western sides to -370 meters below sea level.

The climate of the study area is categorized as arid to semi-arid zone with annual average rainfall ranges from less than 100 mm to 300 mm. Groundwater and surface water flow direction is toward the east to the Jordan River and the Dead Sea. However, water resources in the Jordan Valley are represented mainly by groundwater resources that are wells and springs; and by surface water resources which include Jordan River and some ephemeral flood flow wadis.

Water allocation in the area is 95% for agriculture and the remaining 5% for human consumption. Water for agriculture is mainly utilized for livestock and irrigation.

In terms of catchment areas, Jericho town area is located in the Jordan River Rift Valley of the



West Bank, particularly includes the watershed areas of Wadi Al-Qilt fig .1.

Jordan Valley area plays a major role for economic development since it considered as the main Food Basket for all Palestinian District. Beside that, the health and cultural feature plus the unique landscape have made the area attractive also for tourism. Current economic activities in the area are restricted mainly to agricultural, industrial (water bottling), and tourism. Agricultural Sector represents the main current activity for most of the Palestinian residents. This sector consumes more than 60 % of available water resources for Palestinians which is in general limited to private Palestinian wells and some springs. The private Palestinian wells have been drilled since 1967 and characterized by shallow depths ranged from 50-250 m. Most of these wells are very old and have also old and malfunctioning water distribution systems with gradual decreasing in pump capacity.

Recently, most of Jordan Valley communities become extremely suffered from shortage of safe and reliable water supply for domestic, agricultural, and municipal purposes. The main water supply for these communities is groundwater that is considered as a limited source for wells and springs. Since few years ago, the groundwater resources in many locations of Jordan Valley become suffering from serious problems represented by severe decline in water level and increasing salinity in several production wells, which limit its role in the development.

2 OBJECTIVES

The objective of the survey is to obtain the current conditions of water quality and quantity for four (4) water wells for the Feasibility Study on Agro-Industrial Park Development in Jordan River Rift Valley:

- 1. Three of Pumping wells, for testing its capacity as well water quality analysis:
 - Ismail Deaq well, Id 19-13/26A
 - Hassan Handoun well, Id19-13/050A
 - Zuhdi Hashwah well, Id, 19-13/052
- 2. One of non pumping wells, Jericho well number one, Id (19-14/101, that delivered from Mekoroth to PWA, which needs cleaning from obstacles to test the well capacity and to analysis water quality.

3 GROUNDWATER AQUIFER SYSTEM

Generally, Jericho governorate in Jordan Valley Area is part of the Eastern Basin in the West Bank. The existing aquifer systems within Jericho area consist of the following main aquifers that most of agricultural wells are tapping them:

- The Quaternary Deposits
- The Upper Aquifer System (Jerusalem, Bethlehem, and Hebron Formations)
- The Lower Aquifer System (Yatta, Upper Beit Kahil, and Lower Beit Kahil Formations)

The various aquifer systems are described in detail below.

Quaternary Deposits

Quaternary Aquifer is the main ground water system in Jordan Valley Area since most of the agricultural wells are tapping this aquifer at different depths. The Quaternary Aquifer is not a continuous system along the Jordan Valley; it scattered over different and separated location in Jericho, Al-Uja, and Fasayel areas. These fan deposits were developed along the sides of major wadis that flow through Jordan Valley. Moreover, the geometry of these fans is not determined in precise way; they have a lenses shape with variable thickness and extension forming a good aquifer. The groundwater quality in these fans is varies with location. Generally, good groundwater quality occurs, where fresh groundwater recharge is available. It is believed that this aquifer is overlaying the Lisan Formation, which is act as impermeable or very low permeability layer. Groundwater recharge in this aquifer is taken place through two mechanisms: lateral flow from the Mountain Aquifer that is replenished in the mountain area some 10 to 30 km to the west; and the infiltration of storm water from flooded wadis that crossing the aquifer.

Water level in the Quaternary Aquifer can be found at variable depths ranging from 10 m to 70m or more below ground level. Changes in groundwater levels reflect changes in recharge to, and discharge from an aquifer. In general, groundwater flow in this system is directed to the Jordan River and the Dead Sea.

Upper Aquifer System

The upper aquifer system occurs in the Turonian and Upper Cenomanian Formations. It spreads over the West Bank and is mainly utilized from the Eastern Basin. The Turonian section of the Upper Aquifer consists mostly of massive limestone and dolomite which varies in thickness. It extends well into the Tulkarem area where produces a significant quantity of water.

The Upper Cenomanian section consists mainly of interbedded dolomites and chalky limestone formations (Bethlehem and Hebron formations according to Palestinian terminology). The formation's thickness ranges from 150 meters to 400 meters. Outcrops of this formation are located on the flanks of the Ramallah-Hebron Anticline where the rainfall is relatively high. Direct rainfall forms the main recharge source for this aquifer. The quality of the water from this aquifer is generally good.

Lower Aquifer System

The lower aquifer system is composed of the middle and lower Yatta Formations, the Upper and Lower Beit Kahil Formations (Palestinian Terminology).

The Yatta Formation consists mainly of marl, clay, and marly limestone; and divided into three parts: upper, middle, and lower. The Upper Yatta is an aquitard and generally restricts vertical groundwater flow between the Upper and Lower Aquifers. The Middle and Lower parts of the Yatta Formation form an aquifer which drains water to the lower layers.

The Upper Beit Kahil Formation is composed of regularly interbedded chalky limestone and dolomite. The formation becomes more massive and karstified upwards, while retaining the thin-bedded alternative.

The Lower Beit Kahil Formation is composed of dolomite and limestone interbedded with marl. Although the dolomitic limestone are well-fractured and have good aquifer potential, the chalky units contain clay which inhibits groundwater movement across the strata. The Lower Aquifer is a deep-seated aquifer and classified as having excellent water quantity and quality. The outcropping formations in the Jordan River Rift Valley are shown in **Figure 2**.

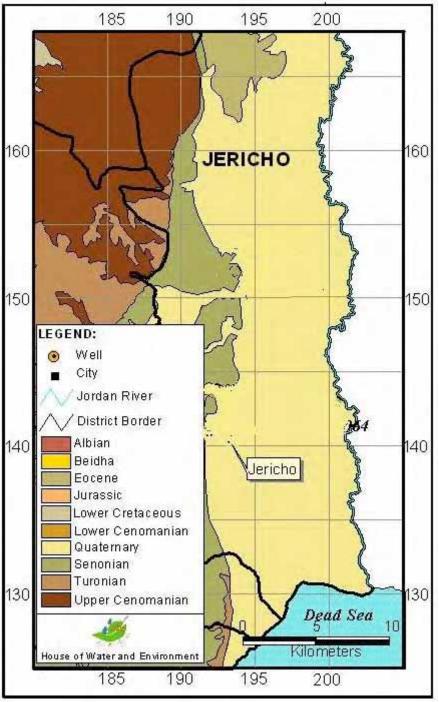


Figure 2: Geological Map of the study area

4 TARGETED WELLS IN JERICHO AREA

The main purpose of this survey is to obtain the current condition of water quality and quantity for four (4) water wells in Jericho area by execution pumping tests for these wells and analysis water quality for the bottled water from these wells.

The water wells that will be surveyed in Jericho area are presented in Table 1.

No.	Code	Point name	Aquifer
1	19-13/026A	Ismail Deaq	Quaternary Deposits
2	19-13/050A	Hassan Handoun	Quaternary Deposits
3	19-13/052	Zuhdi Hashwah	Quaternary Deposits
4	19-14/101	Jericho well no.1	Lower Cenomanian

 Table 1: Targeted water wells in Jericho area for Survey

5 Wells pumping tests

1- Well No.19-13/026A

Well Profile

1. General Information

(The information is according to PWA data base)

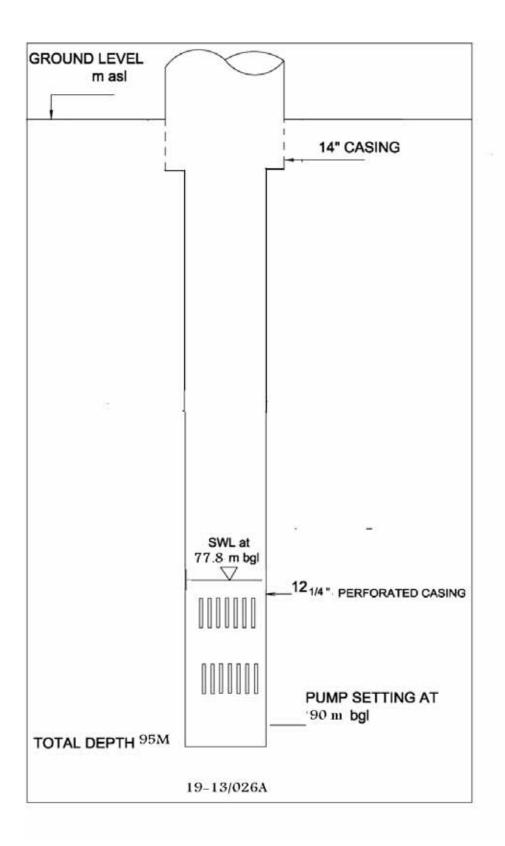
Well Name	Ismail Deaq
Locality Name	Jericho
Well Number	19-13/026A
Coordinates	PGE 195390/ PGN 138800
Status	Pumping
Extraction License	Not available at PWA data base
Average Abstraction	60500 m ³ /year (PWA)
Water Usage	Agriculture

2. Well Structure

Drilling Method	Cable Tool (Percussion)
Total Well Depth	95 m
Upper Casing (Blank)	Ø 14" - steel / welded/ blank
Lower Casing (Screen)	Ø 12" - steel / welded/ perforated

3. Hydro-geological Condition

Tapped Aquifer	Alluvium (Eastern Basin)
Static Water Level	77.77 meters below ground level on 29/08/2008
Discharge Rate	76 m ³ /hr
Dynamic Water Level	89.55 meters below ground level on 29/08/2008
Specific Capacity	6.5 m ³ /hr/m



Pumping test data and analysis

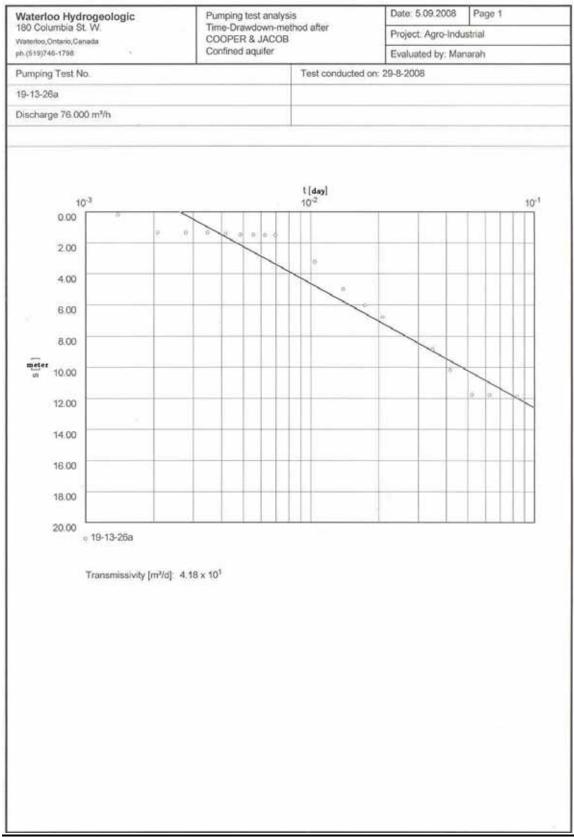
Pumping test data

Well Name:19-13/26ALocation: Jericho /Jordan ValleyS.W.L:77.77m, Well depth:95mbglPump Setting: 90mbglDate:29/08/2008

S.W.L:77.77m	Pump Setting: 90mb	ogl Date:29	te:29/08/2008		
Time (min)	Water Level (m)	Pumping Rate (m ³ /hr)	Remarks		
1					
2	77.95	78			
3	79.1	78			
4	79.1	76			
5	79.1	76			
6	79.2	76			
7	79.25	76			
8	79.25	76			
9	79.27	76			
10	79.27	76			
15	81	76			
20	82.77	76			
25	83.8	76			
30	84.55	76			
50	86.62	76			
60	87.94	76			
75	89.55				
90	89.55				
120	89.65		water table reach to Pump turbine		
150			stop pumping		

Pumping test analysis

o Hydrogeologic	Pumping test analysis		Date: 5.09.2008	Page 2	
				istrial	
8-1798	Confined aquifer		Evaluated by: Ma	y; Manarah	
Pumping Test No.			on: 29-8-2008		
3a		19-13-26a			
ye 76.000 m³/h		Distance from t	he pumping well 0.250 n	n	
ater level: 77.770 m below datum	n				
Pumping test duration	Water level	Dra	awdown		
[day]	[meter]	1	meter]		
		6			
0.00208	79.100		1.330		
States and the second second	79.100		1.330		
0.00347	79.100		1.330		
0.00417	79.200		1.430		
0.00486	79.250		1,480		
0.00556	79.250		1.480		
0.00625	79.270		1.500		
0.00694	79.270		1,500		
0.01042	81.000		3.230		
0.01389	82.770		5.000		
0.01736	83.800	12	6,030		
0.02083	84.550	7	6.780		
0.03472	86.620	3	8.850		
0.04167	87.940		10.170		
0.05208	89.550		11,780		
0.06250	89,550		11.780		
0.08333	89.650	2	11.880		
	3 Test No. 3a 3a 3a 3b 76.000 m³/h ater level: 77,770 m below datum Pumping test duration [day] 0.00139 0.00208 0.00278 0.00278 0.00278 0.00347 0.00417 0.00486 0.00566 0.00565 0.00565 0.00594 0.01136 0.01389 0.01736 0.01736 0.02083 0.02083 0.02083 0.02083 0.03472 0.04167 0.05208 0.05208	ambia St. W. Time-Drawdown-met COOPER & JACOB Confined aquifer 0 Test No. Sa ge 76.000 m³/h ater level: 77.770 m below datum Pumping test duration Water level [day] [meter] 0.00139 77.950 0.00278 79.100 0.00278 79.100 0.00417 79.200 0.00556 79.250 0.00625 79.270 0.00625 79.270 0.0139 82.770 0.00556 79.270 0.00625 79.270 0.01042 81.000 0.0139 82.770 0.0139 82.700 0.0142 81.000 0.01389 82.800 0.02083 84.550 0.02083 89.550 0.04167 87.940 0.05208 89.550	ambia St. W. Time-Drawdown-method after COOPER & JACOB Confined aquifer 0 Test No. Test conducted 9 Test No. Test conducted 3a 19-13-26a ge 76.000 m³/h Distance from t ater level: 77.970 m below datum Pumping test duration Water level Dra [day] [meter] [0.00139 77.950 0 0.00278 79.100 0 0.00347 79.100 0 0.00417 79.200 0 0.00556 79.250 0 0.00625 79.270 0 0.01042 81.000 0 0.0139 82.770 0 0.0139 82.770 0 0.01389 82.8300 0 0.01389 82.8300 0 0.02083 84.550 0 0.03472 86.620 0 0.04167 87.940 0 0.05208 89.550 0	Normal of the product of the	



Recommendations

• The dynamic water level comes near the pump turbine with 76m3/hr, so it's recommended to reduce the well abstraction to 65m3.hr to allow the dynamic water level over the pump turbine settings.

Well Water Quality analysis

Sampling Field trip was conducted to the Well site. The well was operated for certain time to reach a stable condition for the water. Sampling for Microbiological and Chemical testing took place as well as field measurements.

- Microbiological samples were collected in 500 ml sterile glass bottles.
- Chemical samples were collected in 250 ml bottles for major cations and anions
- 250 ml acidified samples collected for the trace measurements.
- Measurement: pH, EC, Turbidity, Temp were taken in the field.

Four (4) Water Samples were taken in accordance to PWA Standards. Samples collected and transported in Ice Box at 4°C, Samples for the major cations and anions were analyzed at the Water Authority of Jordan and the microbiology was done at the PWA labs.

				Samplin	ng Date : 03	3/08/2008	
Component	Symbol	Unit	Palestinian Water Quality Standards	Present Water Quality			
				19-13/026A	19-13/026A	19-13/026A	19-13/026A
				at 13:45	at 14:00	at 14:15	at 14:30
Electrical Conductivity	EC	Us/cm	No limit	4900	4840	4950	4970
Arsenic	As	mg/L	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005
Selenium	Se	mg/L	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride	F	mg/L	< 1.5	0.75	0.68	0.57	0.58
Iron	Fe	mg/L	< 0.3	< 0.1	< 0.1	< 0.1	<0.1
Copper	Cu	mg/L	< 1	< 0.02	< 0.02	< 0.02	< 0.02
Manganese	Mn	mg/L	< 0.1	< 0.02	< 0.02	< 0.02	< 0.02
Chromium	Cr	mg/L	< 0.05	< 0.02	< 0.02	< 0.02	< 0.02
Silver	Ag	mg/L	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02
Sodium	Na	mg/L	< 200	641	618	631	589
Potassium	K	mg/L	< 10	83	78	81	59
Calcium	Ca	mg/L	< 100	137	115	118	95
Magnesium	Mg	mg/L	< 100	176	164	166	140
Bicarbonate	HCO ₃	mg/l	No limit	360	664 *	332	358
Chloride	Cl	mg/L	< 250	1295	1314	1372	1111
Nitrate	NO ₃	mg/L	< 50	33	27	27	50
Sulfate	SO_4	mg/l	< 200	229	203	209	193
Carbonate	CO ₃	mg/l	No limit	<3.5	<3.5	<3.5	<3.5
Total Hardness	TH as CaCO ₃	mg/l	500	1066	960	978	813

Summary of water quality - Well No 19-13/026A

Potential Hydrogen	pН	No Unit	Between 6.5 and 8.5	8.12	8.16	8.1	8.12
Total Dissolved Solids	TDS	mg/L	< 1000	2695	2710	2724	2783
Turbidity	Turb.	NTU	1	0.5	0.35	0.52	0.41
Temperature	Т	°C	No limit	25.5	25.5	25.5	25.5
Total bacteria	TC	FCU	3	90	42	30	22
Fecal bacteria	FC	FCU	0	0	0	0	0
Escherichia coli	E.Coli	FCU	0	0	0	0	0
Organic matter	UV	Abs at $\lambda = 254$ nm	3-10**	0.8	0.9	0.9	0.8

• * : High measured value than expected.

• **: Israeli Guidelines

From the above table

The four samples indicate good replicate results in terms of accuracy. Only one bicarbonate reading seems to be not normal. This could be due to certain error in the analysis.

The Total Dissolved Solids "TDS" and EC are higher than the recommended values for drinking water. Theses results varies between 2695-2783mg/l and 4840 – 4970 Us/cm respectively where the ratio between the EC and TDS is (0.55-0.7). Low turbidity was found when measured in the field

Water Quality data for major Cations and Anions:

Magnesium indicate High concentrations (Average 162 mg/l) more than the recommended values for drinking water "100 mg/l) while relatively high Calcium Concentrations are found in the tested samples.

Fluoride and nitrate shows acceptable values for drinking water. While Sulfate concentration appears to be slightly high in concentration more than the recommended limits for drinking water.

Very High Concentrations of Chloride and Potassium were detected in the measured samples. This could be due to the Aquifer type underlying the well water.

Well water is classified as very hard water.

Water Quality data for Trace Metals

The analytical results shows acceptable concentrations of the analyzed trace metals compared to the Palestinian standards for drinking water.

Water Quality data for Microbiology

Water samples were tested for total and Feacal Coliform as well as E-Coli where the total Coliform bacteria found to be high (more than 3 coloni/100 ml) Thus the water samples are contaminated by total Coliform but free from Feacal contamination. This indicate that the well water is not suitable for drinking unless treatment is applied to the well water before use to drinking purposes.

Organic Matter was analyzed by measuring the absorbance at $\lambda = 254$ nm. There is no Palestinian Standards But according to the Israeli guidelines which is (**3-10**) the organic matter consider to be very low in the analyzed samples

2- Well No.19-13/050A

Well Profile

1. General Information

(The information is according to PWA data base)

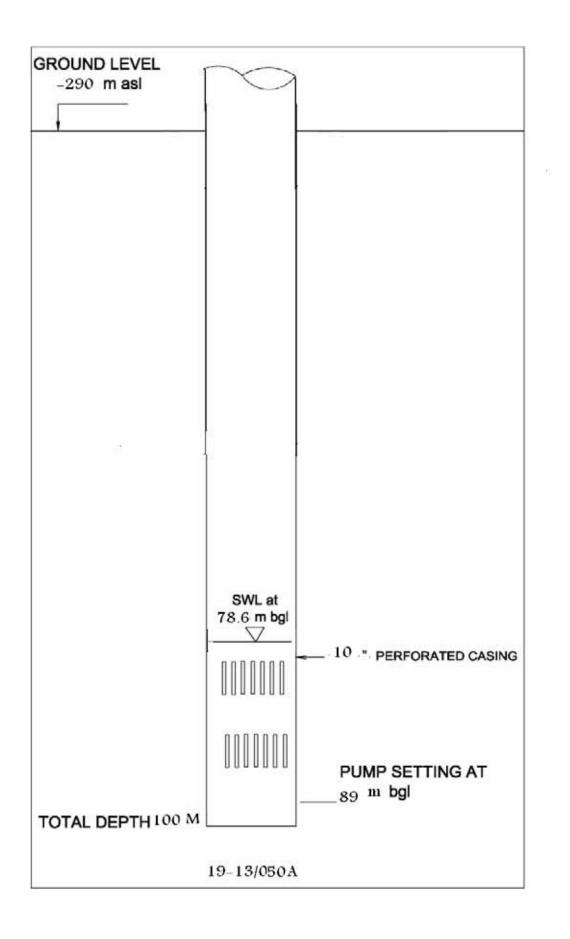
Well Name	Hassan Handoun
Locality Name	Jericho
Well Number	19-13/050A
Coordinates	PGE 195810/ PGN 1393800 / Z : -290 m asl
Status	Pumping
Extraction License	$136000 \text{ m}^{3}/\text{year}$, (PWA)
Average Abstraction	60524 m ³ /year (PWA)
Water Usage	Agricultural

2. Well Structure

Drilling Method Cable Tool (Percussion)			
Total Well Depth	100 m		
Casing (Screen)	Ø 10" - steel / welded/ perforated		

3. Hydro-geological Condition

Tapped Aquifer	Alluvium (Eastern Basin)
Static Water Level	78.60 meters below ground level on 29/08/2008
Discharge Rate	$42 \text{ m}^3/\text{hr}$
Dynamic Water Level	88.85 meters below ground level on 29/08/2008
Specific Capacity	$4.1 \mathrm{m}^3/\mathrm{hr/m}$



Pumping test data and analysis

Pumping test data

Well Name:19-13/50A Location: Jericho /Jordan Valley

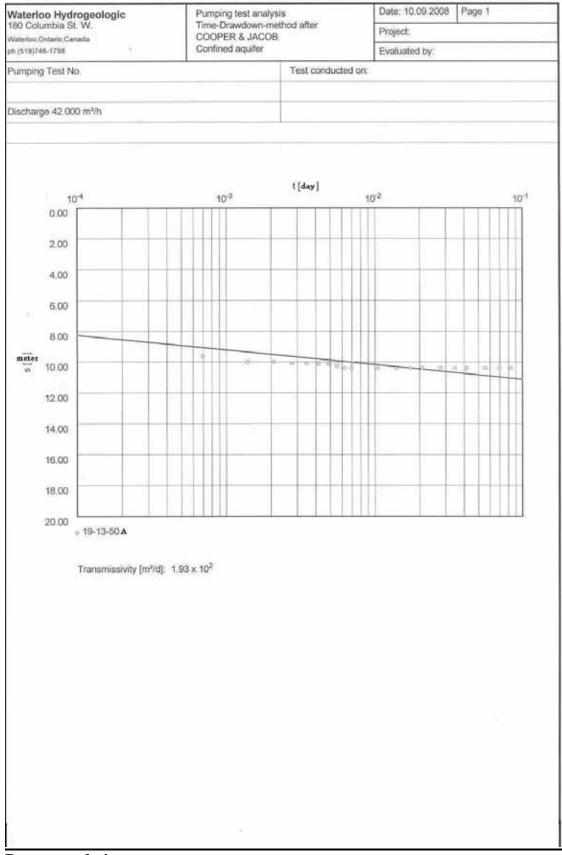
S.W.L:78.6m, Well depth:92mbgl

Pump Setting: 89 mbgl Date:29/08/2008

Time (min)	Water Level (m)	Pumping Rate (m ³ /hr)	Remarks
1	88.24	42	
2	88.6		
3	88.6	42	
4	88.7	42	
5	88.7	42	
6	88.75	42	
7	88.75	42	
8	88.85	42	
9	89	42	
10	89	42	Water table reach pump turbine
15	89	42	
20	89	42	
25	89	42	
30	89	42	
40	89	42	
50	89	42	
60	89	42	
80	89	42	
100	89		
120	89		
140			

Pumping test analysis

Waterloo Hydrogeologic 180 Columbia St. W.		Pumping test analysis Time-Drawdown-met	5 he d affect	Date: 10.09.2008	Page 2	
Waterfoo,	Ontario, Canada	COOPER & JACOB	noo alter	Project:		
ph (519)7	45-1798	Confined aquifer		Evaluated by:		
Pumpin	g Test No.		Test conducted on:			
			19-13-50 A			
Dischar	ge 42.000 m³/h		Distance from t	he pumping well 0.250 m	E	
Static w	ater level: 78.600 m below datur	n				
	Pumping test duration	Water level	Dra	awdown		
	[day]	[meter]		[meter]		
1	0.00069	88.240		9.640		
2	0.00139	88,600		10.000		
3	0.00208	88.600		10.000		
4	0.00278	88.700		10.100		
5	0.00347	88.700		10.100		
6	0.00417	88.750		10.150		
7	0.00486	88.750		10.150		
8	0.00556	88,850		10.250		
9	0.00625	89.000		10.400		
10	0.00694	89,000		10.400		
11	0.01042	89,000		10.400		
12	0.01389	89.000		10.400		
13	0.01738	89,000		10.400		
14	0.02083	89.000		10.400		
15	0.02778	89.000		10.400		
16	0.03472	89.000		10.400		
17	0.04167	89.000		10.400		
18	0.05556	89.000		10.400		
19	0.06944	89.000		10.400		
20	0.08333	89.000		10.400		
				120185		
10						
_						



Recommendations

• The dynamic water level comes near the pump turbine with 42m3/hr, so it's recommended to reduce the well abstraction to 35m3.hr to allow the dynamic water level over the pump turbine settings.

Well Water Quality analysis

Sampling Field trip was conducted to the Well site. The well was operated for certain time to reach a stable condition for the water. Sampling for Microbiological and Chemical testing took place as well as field measurements.

- Microbiological samples were collected in 500 ml sterile glass bottles.
- Chemical samples were collected in 250 ml bottles for major cations and anions
- 250 ml acidified samples collected for the trace measurements.
- Measurement: pH, EC, Turbidity, Temp were taken in the field.

Three Water Samples were taken in accordance to PWA Standards, Their was a shut down in the well before taking the 4th sample, which make it difficult to take the sample in the same day. Samples collected and transported in Ice Box at 4°C, Samples for the major cations and anions were analyzed at the Water Authority of Jordan and the microbiology was done at the PWA labs.

				Sampling Dat	te: 03/08/2008		
Component	Symbol	Unit	Palestinian Water Quality Standards	Present Water Quality			
				19-13/50A	19-13/50A	19-13/50A	
				At 13:00	At 13:15	At 13:30	
Electrical Conductivity	EC	Us/cm	No limit	1678	1671	1679	
Arsenic	As	mg/L	< 0.05	< 0.005	< 0.005	< 0.005	
Selenium	Se	mg/L	< 0.01	< 0.005	< 0.005	< 0.005	
Fluoride	F	mg/L	< 1.5	0.55	0.46	0.3	
Iron	Fe	mg/L	< 0.3	< 0.1	< 0.1	< 0.1	
Copper	Cu	mg/L	< 1	< 0.02	< 0.02	< 0.02	
Manganese	Mn	mg/L	< 0.1	< 0.02	< 0.02	< 0.02	
Chromium	Cr	mg/L	< 0.05	< 0.02	< 0.02	< 0.02	
Silver	Ag	mg/L	< 0.01	< 0.02	< 0.02	< 0.02	
Sodium	Na	mg/L	< 200	156	149	152	
Potassium	K	mg/L	< 10	25	24	24	
Calcium	Ca	mg/L	< 100	74	62	58	
Magnesium	Mg	mg/L	< 100	70	67	68	
Bicarbonate	HCO ₃	mg/l	No limit	337	291	281	
Chloride	Cl	mg/L	< 250	348	347	345	
Nitrate	NO ₃	mg/L	< 50	33	32	31	
Sulfate	SO_4	mg/l	< 200	97	89	87	
Carbonate	CO ₃	mg/l	No limit	<3.5	<3.5	<3.5	
Total Hardness	TH as CaCO ₃	mg/l	500	475	431	427	

Summary of water quality - Well No 19-13/050A

Potential Hydrogen	pН	No Unit	Between 6.5 and 8.5	8.05	8.24	8.25
Total Dissolved Solids	TDS	mg/L	< 1000	923	936	940
Turbidity	Turb.	NTU	1	1.75	0.94	1.07
Temperature	Т	°C	No limit	25.5	24.5	24.5
Total bacteria	TC	FCU	3	45	50	48
Fecal bacteria	FC	FCU	0	0	0	0
Escherichia coli	E. Coli	FCU	0	0	0	0
Organic matter	UV	Abs at $\lambda = 254$ nm	3-10**	0.8	0.8	0.9

• **: Israeli Guidelines

Water Quality Data for Major Cations and Anions

As can be concluded from the above table that the Total dissolved solids and EC are within the limits for drinking water, while the Chloride concentration appears to be high (347 mg/l) compared to the allowable limits for drinking water (250 mg/l).

Normal results are found for fluoride, Sodium, Calcium, Magnesium, nitrate and sulfate. The water quality data are within the acceptable values for drinking water.

Potassium shows double values than the recommended limits and consider to be high.

Water is classified as moderate hard water.

Water Quality data for Trace Metals

The analytical results shows acceptable concentrations of the analyzed trace metals compared to the Palestinian standards for drinking water.

Water Quality data for Microbiology

Water samples were tested for total and Feacal Coliform as well as E-Coli where the total Coliform bacteria found to be high (more than 3 coloni/100 ml) Thus the water samples are contaminated by total Coliform but free from Feacal contamination. This indicate that the well water is not suitable for drinking unless treatment is applied to the well water before use to drinking purposes.

Organic Matter was analyzed by measuring the absorbance at $\lambda = 254$ nm. There is no Palestinian Standards But according to the Israeli guidelines which is (**3-10**) the organic matter considers to be very low in the analyzed samples.

3- Well No.19-13/052

Well Profile

1. General Information

(The information is according to PWA data base)

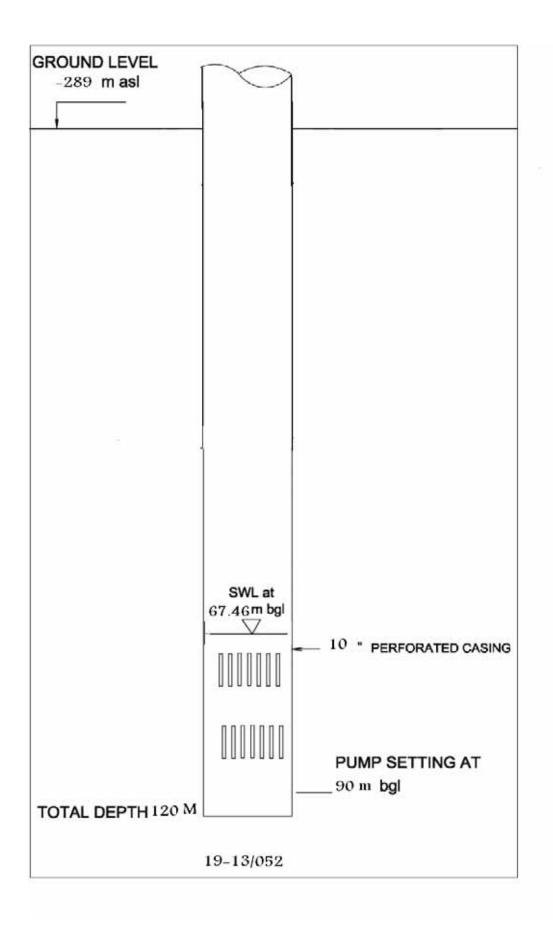
Well Name	Zuhdi Hashwah
Locality Name	Jericho
Well Number	19-13/052
Coordinates	PGE 195880/ PGN 139670 / Z : -289 m asl
Status	Pumping
Extraction License	$241000 \text{ m}^3/\text{year}, (PWA)$
Average Abstraction	15693 m ³ /year (PWA)
Water Usage	Agriculture

2. Well Structure

Drilling Method	Cable Tool (Percussion)
Total Well Depth	120m
Casing (Screen)	Ø 10" - steel / welded/ perforated

3. Hydro-geological Condition

Tapped Aquifer	Alluvium (Eastern Basin)
Static Water Level	67.46 meters below ground level on 29/08/2008
Discharge Rate	33 m ³ /hr
Dynamic Water Level	84.58 meters below ground level on 29/08/2008
Specific Capacity	1.9 m ³ /hr/m



Pumping test data and analysis

Pumping test data

Well Name:19-13/052 Location: Jericho /Jordan Valley

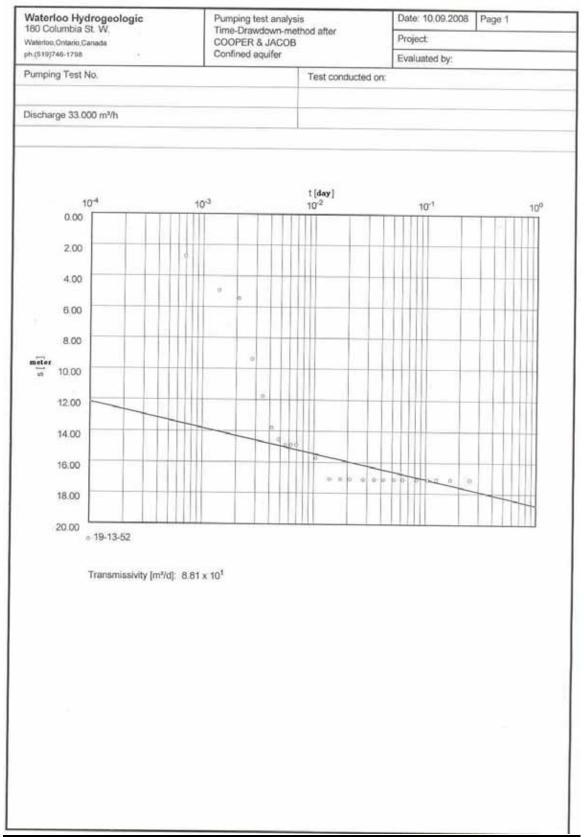
S.W.L:67.46m, Well depth:120mbgl

Pump Setting: 90mbgl Date:29/08/2008

Time (min)	Water Level (m)	Pumping Rate (m ³ /hr)	Remarks
1	70.2	38	
2	72.4	33	
3	72.93	33	
4	76.85	33	
5	79.25	33	
6	81.26	33	
7	82	33	
8	82.35	33	
9	82.35	33	
10	82.35	33	
15	83.2	33	
20	84.55	33	
25	84.55	33	
30	84.55	33	
40	84.58	33	
50	84.58	33	
60	84.58	33	
75	84.58	33	
90	84.58	33	
120	84.58	33	
150	84.58	33	
180	84.58	33	
240	84.58	33	
360	84.58	33	Specific capacity=2m3/h/m

Pumping test analysis

		Pumping test analysis		Date: 10.09.2008	Page 2	
	umbia St. W. Ontario.Canada	Time-Drawdown-meth COOPER & JACOB	nod after	Project:	Project	
	46-1798	Confined aquifer	Evaluated by:			
>umpin	g Test No.		Test conducted	i on:		
			19-13-52			
Dischar	ge 33.000 m³/h		Distance from t	he pumping well 0.250 m		
Static w	ater level: 67.460 m below datum	1				
	Pumping test duration			awdown		
_	[day]	[meter]	1	meter]		
- <u>1</u>	0.00069	70.200	1	2.740		
2	0.00139	72.400		4,940		
3	0.00208	72.930		5.470		
4	0.00278	76.850	-	9.390		
5	0.00347 0.00417	79.250		11,790		
6	0.00417	81.260		13,800		
7	0.00466	82.000		14.540		
9	0.00625	82.350		14,890		
10	0.00694	82.350		14,890		
11	0.01042	83.200	-	15.740		
12	0.01389	84 550	-	17.090		
13	0.01738	84.550		17.090		
14	0.02083	84.550		17.090		
15	0.02778	84,580		17.120		
16	0.03472	84.580		17.120		
17	0.04167	84.580		17.120		
18	0.05208	84.580		17.120		
19	0.06250	84.580		17.120		
20	0.08333	84.580		17.120		
21	0.10417	84,580		17.120		
22	0.12500	84.580		17.120		
23 24	0.16667	84,580 84 580		17.120		
29	0.25000	080,40	-	17.120		
-			-			
			-			
_						
-						
-						
-						
-						
-						



Recommendations

• There is a possibility for increasing the well pumping capacity up to 40m3/hr with increasing the pump setting to 100mbgl.

Sampling Field trip was conducted to the Well site. The well was operated for certain time to reach a stable condition for the water. Sampling for Microbiological and Chemical testing took place as well as field measurements.

- Microbiological samples were collected in 500 ml sterile glass bottles.
- Chemical samples were collected in 250 ml bottles for major cations and anions
- 250 ml acidified samples collected for the trace measurements.
- Measurement: pH, EC, Turbidity, Temp were taken in the field.

Four (4) Water Samples were taken in accordance to PWA Standards. Samples collected and transported in Ice Box at 4°C, Samples for the major cations and anions were analyzed at the Water Authority of Jordan and the microbiology was done at the PWA labs.

			Sampling Date : 03/08/2008					
Component	Symbol	Unit	Palestinian Water Quality Standards	Present Water Quality				
				19-13/052	19-13/052	19-13/052	19-13/052	
				at 11:30	at 11:45	at 12:00	At 12:15	
Electrical Conductivity	EC	Us/cm	No limit	2100	1970	2080	2030	
Arsenic	As	mg/L	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005	
Selenium	Se	mg/L	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	
Fluoride	F	mg/L	< 1.5	0.59	0.53	0.66	0.52	
Iron	Fe	mg/L	< 0.3	< 0.1	< 0.1	< 0.1	0.33	
Copper	Cu	mg/L	< 1	< 0.02	< 0.02	< 0.02	< 0.02	
Manganese	Mn	mg/L	< 0.1	< 0.02	< 0.02	< 0.02	< 0.02	
Chromium	Cr	mg/L	< 0.05	< 0.02	< 0.02	< 0.02	< 0.02	
Silver	Ag	mg/L	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	
Sodium	Na	mg/L	< 200	170	187	191	190	
Potassium	K	mg/L	< 10	25	27	27	28	
Calcium	Ca	mg/L	< 100	80	56	78	65	
Magnesium	Mg	mg/L	< 100	80	84	83	84	
Bicarbonate	HCO ₃	mg/l	No limit	323	187	299	239	
Chloride	Cl	mg/L	< 250	391	368	442	428	
Nitrate	NO ₃	mg/L	< 50	44	43	35	36	
Sulfate	SO_4	mg/l	< 200	159	147	170	162	
Carbonate	CO ₃	mg/l	No limit	<3.5	21.6 *	<3.5	12.6 *	
Total Hardness	TH as CaCO ₃	mg/l	500	529	484	536	507	

Summary of water quality - Well No- 19-13/052

Potential Hydrogen	pH	No Unit	Between 6.5 and 8.5	8.05	8.47	8.1	8.33
Total Dissolved Solids	TDS	mg/L	< 1000	1155	1123	1133	1117
Turbidity	Turb.	NTU	1	0.89	1.72	1.49	1.82
Temperature	Т	°C	No limit	25	25.5	25	25.5
Total bacteria	TC	FCU	3	88	70	65	63
Fecal bacteria	FC	FCU	0	0	0	0	0
Escherichia coli	E. Coli	FCU	0	0	0	0	0
Organic matter	UV	Abs at λ= 254 nm	3-10**	0.9	0.7	0.9	0.8

• * : Measured Values are Suspicious: Need to reanalyze Carbonate when start using the well

• **: Israeli Guidelines

Water Quality Data for Major Cations and Anions

Water quality results in the above table shows that the Total dissolved solids and EC are slightly higher than the recommended limits for drinking water, while the Chloride concentration appears to be high (407 mg/l) compared to the allowable limits for drinking water (250 mg/l).

Normal results are found for fluoride, Calcium, Magnesium and nitrate. The water quality data are within the acceptable values for drinking water.

Sulfate and chloride concentrations are less than the allowable limits but still consider relatively high.

Potassium shows triple values than the recommended and consider to be high.

Carbonate results are varied and questionable as big difference can be noticed between the four analyzed samples. Water is classified as moderate hard water.

Water Quality data for Trace Metals

The analytical results shows acceptable concentrations of the analyzed trace metals compared to the Palestinian standards for drinking water.

Water Quality data for Microbiology

Water samples were tested for total and Feacal Coliform as well as E-Coli where the total Coliform bacteria found to be high (more than 3 coloni/100 ml) Thus the water samples are contaminated by total Coliform but free from Feacal contamination. This indicate that the well water is not suitable for drinking unless treatment is applied to the well water before use to drinking purposes.

Organic Matter was analyzed by measuring the absorbance at $\lambda = 254$ nm. There is no Palestinian Standards But according to the Israeli guidelines which is (**3-10**) the organic matter consider to be very low in the analyzed samples

1- Well No.19-14/101

Well Profile

1. General Information

(The information is according to PWA data base)

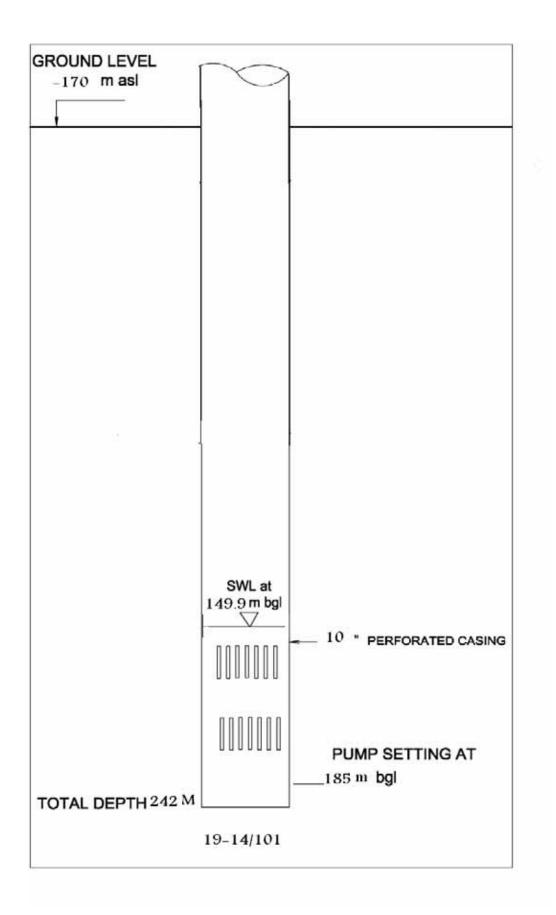
Well Name	Jericho well no.1
Locality Name	Jericho /Aqabat Jaber Camp
Well Number	19-14/101
Coordinates	PGE 190900/ PGN 140730 / Z :-170 m asl
Status	Non Pumping
Extraction License	Not available at PWA data base
Average Abstraction	Not available at PWA data base
Water Usage	Mekarotrh

2. Well Structure

Drilling Method	Rotary
Total Well Depth	243.5 m
Drilling Diameter/Length	Not available at PWA data base
Lower Casing (Screen)	Ø 10" - steel / welded/ perforated

3. Hydro-geological Condition

Tapped Aquifer	Lower Cenomanian (Eastern Basin)		
Static Water Level	149.9 meters below ground level on 23/08/2008		
Discharge Rate	50 m ³ /hr , pumping test on 23/08/2008		
Dynamic Water Level	152.6 meters below ground level on 29/08/2008		
Specific Capacity	$19.2 \text{ m}^{3}/\text{hr/m}$		



Pumping test data and analysis

Pumping test data

Step Draw Down Test

Well Name: Jericho No.1Location: Jericho /Jordan ValleyS.W.L:149.9mWell depth:243.5mbglPump Setting:185mbglDate:23/08/2008

Time (min)	Water Level (m)	Pumping Rate (m ³ /hr)	Remarks
1st step			
1	150.05	33	
2	150.05	33	
4	150.05	33	
6	150	33	
8	150	33	
10	150	33	
15	150	33	
20	150	33	
30	150	33	
45	150	33	
60	150	33	
75	150	33	
100	150	33	
120	150	33	
2nd Step			
1	150	42	
2	150	42	
4	150	42	
6	150	42	
8	150	42	
10	150	42	
15	150	42	
20	150	42	
30	150	42	
45	150	42	
60	150	42	
75	150	42	
100			
120			
3rd Step			
1	150.37	50	
2	150.37	50	
4	150.37	50	
6	150.37	50	

8	150.37	50	
10	150.37	50	
15	150.37	50	
20	150.37	50	
30	150.37	50	
45	150.37	50	
60 (1hr)	150.37	50	
75	150.37	50	
90	150.37	50	
120	150.37	50	

4th Step			
1	150.75	60	
2	150.85	60	
4	150.85	60	
6	150.85	60	
8	150.85	60	
10	150.85	60	
15	150.85	60	
20	150.85	60	
30	150.85	60	
45	150.85	60	
60 (1hr)	150.85	60	
75	150.85	60	
90	150.85	60	
120	150.85	60	

Continuous yield

Well Name: Jericho No.1 Location: Jericho /Jordan Valley

S.W.L:151.5m, Well depth:243.5mbgl

Pump Setting: 185mbgl Date:24/08/2008

Time (min)	Water Level (m)	Pumping Rate (m ³ /hr)	Remarks
1			
2	152.6	60	
3			
4	152.6	60	
5			
6	152.6		
7			
8	152.6		
9	152.6		

10	152.6	54	
15	152.6		
20	152.6		
25	152.6		
30	152.6		
40	152.6		
50	152.6		
60	152.6		
80	152.6		
100	152.6		
120	152.6		
140	152.6		
			Pumping stop due to
170			mechanical failure
200			
230	152.45	48	
260	152.45		
320	152.5		
380	152.55	48	
440	152.6		
500	152.6		
560	152.6	48	
620	152.6		
680	152.6		
740	152.6		
800	152.6	48	
860	152.6		
920	152.6		
980	152.6		
1040	152.6		
1100	152.6		
1160	152.6	50	
1220	152.6		
1280	152.6	50	
1340	152.6		
1400	152.6	50	
1460	152.6	50	
1520	152.6	50	
1580	152.6	50	
1640	152.6	50	
1700	152.6	50	
1760	152.6	50	
1820	152.6	50	
1880	152.6	50	
1940	152.6	50	
2000	152.6	50	
2060	152.6	50	
2120	152.6	50	
2180	152.6	50	

2240	152.6	50	
2300	152.6	50	
2360	152.6	50	
2420	152.6	50	
2480	152.6	50	
2540	152.6	50	
2600	152.6	50	
2660	152.6	50	
2720	152.6	50	

Recovery Test

Well Name: Jericho No.1 Location: Jericho /Jordan Valley

S.W.L:151.5m, Well depth:243.5mbgl

Pump Setting:185mbgl Da

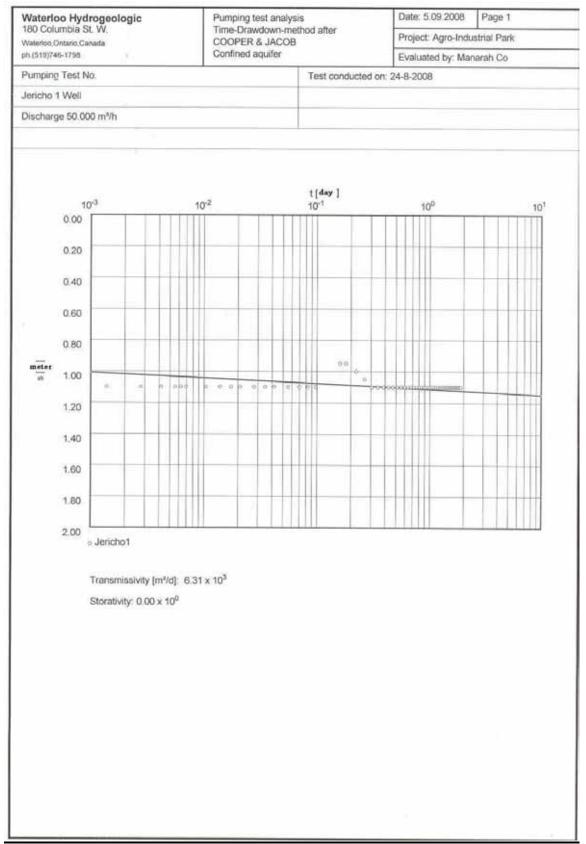
Date:24/08/2008

Time (min)	Recovered Water Level (m)	Remarks
1	151.35	
2	151.45	
3	151.45	
4	151.45	
5	151.47	
6	151.47	
7	151.53	
8	151.5	
9	151.55	
10	151.56	
12	151.59	
14	151.59	
16	151.59	
18	151.55	
20	151.55	
30	151.51	
40	151.51	

Pumping test analysis

Vaterio	o Hydrogeologic	Pumping test analysis		Date: 5.09.2008	Page 2
80 Colu	umbia St. W. Intario.Canada	Time-Drawdown-meth COOPER & JACOB	nod after	Project Agro-Ind	ustrial Park
vaterico, O h. (519)74		Confined aquifer		Evaluated by: Ma	anarah Co
Pumping	Test No.		Test conducted	on: 24-8-2008	
Jericho 1			Jericho1		
Dischard	e 50.000 m³/h		Distance from t	he pumping well 0.400	m
	ater level: 151.500 m below data	m		1.1.1	
Statue we	Pumping test duration	Water level	De	wdown	
	Pumping test duration	vvalet level	DR	IN DOWN	
	[day]	[meter]	1	meter]	
1	0.00139	152.600		1,100	
2	0.00278	152.600		1,100	
3	0.00417	152.600		1,100	
4	0.00556	152.600		1,100	
5	0.00625	152.600		1.100	
6	0.00694	152,600		1,100	
7	0.01042	152.600		1.100	
8	0.01389	152.600		1.100	
9	0.01736	152.600		1.100	
10	0.02083	152.600		1.100	
11	0.02778	152.600		1.100	
12	0.03472	152.600		1.100	
13	0.04167	152.600		1.100	
14	0.05556	152.600		1.100	
15	0.06944	152.600		1.100	
16	0,08333	152.600		1.100	
17	0.09722	152.600		1.100	
18	0.15972	152.450		0.950	
19	0.18056	152.450		0.950	
20	0.22222	152.500		1.000	
21	0.26389	152.550		1.050	
22	0.30556	152.600		1.100	
23	0.34722	152.600	5 T	1,100	
24	0.38889	152.600		1.100	
25	0.43056	152.600	0	1.100	
26	0.47222	152.600		1.100	
27	0.51389	152.600		1.100	
28	0.55556	152.600		1,100	
29	0.59722	152.600	1	1.100	
30	0.63889	152.600		1.100	
31	0.68056	152.600	11	1.100	
32	0.72222	152.600	11	1,100	
33	0.76389	152,600	51	1.100	
34	0.80556	152.600		1,100	
35	0.84722	152.600		1,100	
36	0.88889	152.600	t i t i i i i i i i i i i i i i i i i i	1,100	
37	0.93056	152.600		1.100	
38	0.97222	152.600		1.100	
39	1.01389	152.600		1.100	
40	1.05556	152.600		1.100	
41	1.09722	152.600		1.100	
42	1.13889	152.600		1.100	
43	1.18056	152.600		1.100	
44	1.22222	152.600		1.100	
45	1.26389	152.600		1.100	
46	1.30556	152.600		1.100	
47	1.34722	152.600		1.100	
48	1.38889	152.600		1.100	
49	1.43056	152.600		1.100	
50	1.47222	152.600	17 I.	1.100	

Waterloo I	Hydrogeologic Jia St. W.	Pumping test analysis	5	Date: 5.09.2008	Page 3
180 Columb Vaterico, Ontai		Time-Drawdown-met COOPER & JACOB	nod atter	Project: Agro-In	dustrial Park
ih (519)746-17	98 .	Confined aquifer		Evaluated by: M	lanarah Co
Pumping Te	est No.		Test conducted	d on: 24-8-2008	
Jericho 1 W	/ell		Jericho1		
Discharge 5	0.000 m³/h		Distance from	the pumping well 0.400	m
Static water	level: 151.500 m below datu	m			
	umping test duration	Water level	Dr	awdown	
	- A 19 19 19 19 19 19 19 19 19 19 19 19 19			S S	
E4	[day]	[meter] 152.600	_	[meter]	
51 52	1.51389	152.600	_	1.100	
53	1.59722	152.600	_	1.100	
53	1.63889	152.600	_	1.100	
55	1.68056	152.600	_	1.100	
56	1.72222	152.600		1.100	
57	1.76389	152.600	_	1.100	
58	1.80556	152.600		1.100	
59	1.84722	152.600		1.100	
60	1.88889	152.600		1,100	
			_		
			_		
_					
			_		
			-		
			_		
_			-		



Recommendations

• The well specific capacity is good (well yield by the draw down), so can increase the well pumping rate to 100m3/hr with approximate dynamic water level around 155mbgl.

Well Water Quality analysis

Sampling Field trip was conducted to the Well site. The well was operated for certain time to reach a stable condition for the water. Sampling for Microbiological and Chemical testing took place as well as field measurements.

- Microbiological samples were collected in 500 ml sterile glass bottles.
- Chemical samples were collected in 250 ml bottles for major cations and anions
- 250 ml acidified samples collected for the trace measurements.
- Measurement: pH, EC, Turbidity were taken in the field.

Four (4) Water Samples were taken in accordance to PWA Standards. Samples collected and transported in Ice Box at 4°C, Samples for the major cations and anions were analyzed at the Water Authority of Jordan and the microbiology was done at the PWA labs.

				Sampling	g Date : 24/	08/2008	
Component	Symbol	Unit	Palestinian Water Quality Standards		Present W	/ater Qualit	у
				Jericho 1	Jericho 1	Jericho 1	Jericho 1
				at 6:00	at 7:00	after 3 hrs pump	after 30 hrs pump
Electrical Conductivity	EC	Us/cm	No limit	1760	1743	1731	1782
Arsenic	As	mg/L	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005
Selenium	Se	mg/L	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride	F	mg/L	< 1.5	0.33	0.39	0.4	0.4
Iron	Fe	mg/L	< 0.3	0.57	0.88	0.41	0.78
Copper	Cu	mg/L	< 1	< 0.02	0.02	< 0.02	< 0.02
Manganese	Mn	mg/L	< 0.1	0.13	0.11	0.08	0.11
Chromium	Cr	mg/L	< 0.05	< 0.02	< 0.02	< 0.02	< 0.02
Silver	Ag	mg/L	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02
Sodium	Na	mg/L	< 200	152	148	151	Not Measured
Potassium	K	mg/L	< 10	15	14	14	Not Measured
Calcium	Ca	mg/L	< 100	86	87	80	Not Measured
Magnesium	Mg	mg/L	< 100	64	63	64	Not Measured
Bicarbonate	HCO ₃	mg/l	No limit	243	267	255	261
Chloride	Cl	mg/L	< 250	419	426	448	430
Nitrate	NO ₃	mg/L	< 50	15	13	13	13

Summary of water quality - Well No. 19-14/101

Sulfate	SO_4	mg/l	< 200	44	34	35	38
Carbonate	CO ₃	mg/l	No limit	<3.5	<3.5	<3.5	Not Measured
Total Hardness	TH as CaCO3	mg/l	500	479	479	464	Not Measured
Potential Hydrogen	рН	No Unit	Between 6.5 and 8.5	7.98	7.98	8.03	7.97
Total Dissolved Solids	TDS	mg/L	< 1000	985	959	978	964
Turbidity	Turb.	NTU	1	0.95	0.81	0.9	0.83
Temperature	Т	°C	No limit	Not Measured	Not measured	Not Measured	Not Measured
Total bacteria	TC	FCU	3	TMTC	TMTC	TMTC	TMTC
Fecal bacteria	FC	FCU	0	7	6	8	8
Escherichia coli	E.Coli	FCU	0	***	***	***	***
Organic matter	UV	Abs at λ= 254 nm	3-10**	0.9	0.8	0.9	1.1

• TMTC: too many to count

• **: Israeli Guidelines

• *** Colonies were not clear in the cultured samples , unable to repeat the test due to closure of the Well

Three water samples were analyzed for complete parameters the 4th water sample was partially analyzed at the PWA lab. The WAJ lab did not analyze the 4th sample it seems some misunderstanding.

Water Quality Data for Major Cations and Anions

Water quality results shown in the table shows that the Total dissolved solids and EC are slightly higher than the recommended limits for drinking water, while the Chloride concentration appears to be high (426 mg/l) compared to the allowable limits for drinking water (250 mg/l).

Normal results are found for fluoride, Calcium, Magnesium, sodium, Sulfate and nitrate. The water quality data are within the acceptable values for drinking water.

Potassium concentrations are higher than the allowable limits for drinking water. Water is classified as moderate hard water where the calcium concentration is dominate.

Water Quality Data for Trace Metals

The water quality analytical results show acceptable concentrations of the analyzed trace metals compared to the Palestinian standards for drinking water **except for Iron and Manganese** which indicate high results and expected to need treatment before use for drinking purposes.

Water Quality Data for Microbiology

Water samples were tested for total and Feacal Coliform as well as E-Coli where the total Coliform bacteria found to be (Too Many To Count TMTC) higher than 3 Colony /100 ml which indicate that the water samples are contaminated by total Coliform bacteria. Feacal contamination for the analyzed samples could be resulted from the long closure period of the well or due to the use of not disinfected equipments. More accurate results can be judged after the well development and disinfection. **E** –coli colonies were not clear, it was unable top repeat the test for more accurate results. This should be considered later when decision to be taken to use the well water for drinking

Organic Matter was analyzed by measuring the absorbance at $\lambda = 254$ nm. There is no Palestinian Standards But according to the Israeli guidelines which is (**3-10**) the organic matter consider to be very low in the analyzed samples

		SISUBILA	Test	Analysis Test Report	Khansa a Street, Biader Waat Esseer (next to Civit Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196910	Lab Ref.	200196910	
Submission No : 100068789 Location Description : 19 -13 / 52 Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 11:30:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	2100	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.05	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	03)
N Calcium	80.36	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	79.89	mg/L	0.3	Ion Chromatographic Method	
N Sodium	170.43	mg/L	0.3	Ion Chromatographic Method	
N Potassium	24.63	mg/L	0.3	Ion Chromatographic Method	
N Chloride	391.21	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	159.36	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	322.69	mg/L	8.5	Titrimetric Method	
N Nitrate	44.41	mg/L	0.2	Ion Chromatographic	
N Hardness	529	mg/L As CaCO3	5	EDTA Titrimetric Method	

	Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
Submission No : 100068789	Sample No & Lab Ref. 200196911
Location Description : 19-15/ 22 Jericno	Sampled By: E.Majedah AlawnaSample Recieved On: 28-AUG-2008Issue Status&Date: Complete 25/09/2008 09:54 AMSampling Date: 03-AUG-2008 11:45:00Report Status: Routine
Component Result Units	LRV Method Used
A Electrical Conductivity Us/cm	0.62 Laboratory Method (Ref: CHI-EC-R*004)
A pH 8.47	N/A Electrometric Method (Ref: CHI-PH-R*003)
^N Calcium 55.71	0.3 Ion Chromatographic Method
^N Magnesium 84.03	0.3 Ion Chromatographic Method
^N Sodium 187.22	0.3 Ion Chromatographic Method
^N Potassium 27.76	0.3 Ion Chromatographic Method
^N Chloride 368.49	0.5 Ion Chromatographic Method
N Sulfate 146.88	0.3 Ion Chromatographic Method
N Carbonate 21.6	3.5 Titrimetric Method
N Bicarbonate 186.66	8.5 Titrimetric Method
N Nitrate 42.72	0.2 Ion Chromatographic
^N Hardness 484 mg/L As CaCO3	03 5 EDTA Titrimetric Method

		Analysis Test Keport	Test	Report	khansa a Street, Biader Wadi Esseer (next to Civit Defence Department) Annnan 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196912	Lab Ref.	200196912	
Submission No : 100068789 Location Description : 19 -13 / 52 Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 12:15:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	2030	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.33	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	33)
N Calcium	64.53	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	84.03	mg/L	0.3	Ion Chromatographic Method	
N Sodium	190.9	mg/L	0.3	Ion Chromatographic Method	
N Potassium	28.15	mg/L	0.3	Ion Chromatographic Method	
N Chloride	427.78	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	162.24	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	12.6	mg/L	3.5	Titrimetric Method	
N Bicarbonate	239.12	mg/L	8.5	Titrimetric Method	
N Nitrate	36.03	mg/L	0.2	Ion Chromatographic	
N Hardness	507	mg/L As CaCO3	5	EDTA Titrimetric Method	

		Allalysis	Test	Analysis Test Report	Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196913	Lab Ref.	200196913	
Submission No : 100068789 Location Description : 19 -13 / 52 Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 12:00:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	2080	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.10	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	03)
N Calcium	78.16	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	82.81	mg/L	0.3	Ion Chromatographic Method	
N Sodium	191.13	mg/L	0.3	Ion Chromatographic Method	
N Potassium	27.37	mg/L	0.3	Ion Chromatographic Method	
N Chloride	442.33	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	170.88	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	298.9	mg/L	8.5	Titrimetric Method	
N Nitrate	34.83	mg/L	0.2	Ion Chromatographic	
N Hardness	536	mg/L As CaCO3	5	EDTA Titrimetric Method	

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		Analysis Test Report	Test	Report	Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196914	Lab Ref.	200196914	
Submission No : 100068789 Location Description : 19-13/50 A Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 13:00:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	1678	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.05	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	33)
N Calcium	74.15	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	70.41	mg/L	0.3	Ion Chromatographic Method	
N Sodium	156.63	mg/L	0.3	Ion Chromatographic Method	
N Potassium	24.63	mg/L	0.3	Ion Chromatographic Method	
N Chloride	347.9	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	96.96	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	337.33	mg/L	8.5	Titrimetric Method	
N Nitrate	33.22	mg/L	0.2	Ion Chromatographic	
N Hardness	475	mg/L As CaCO3	5	EDTA Titrimetric Method	

Sample No & Lab Ref. 200196915 Sampled By Sampled By Sampled By Sampled By Sample Recieved On Sampling Date Sampling Date Sampling Date Sampling Date Sample Recieved On Sample Recieved On Sample Recieved On Sampling Date Sample Recieved On Sample Recin CHI-PH-R*003 Sample Recieve	Sample No & Lab Ref. 200196915 Sampled By Sampled By Sample Recieved On Sampling Date Sampling Date Units LRV Units Laboratory Method (Ref: CHI-EC-R*004) Unit 0.62 Laboratory Method (Ref: CHI-PH-R*003)
ubmission No : 100068789 ocation Description : 19-13 / 50 A Jericho ocation Description : 19-13 / 50 A Jericho complex Sample Recieved On Issue Status&Date Component Report Status Component Result Units Component Result Units Electrical Conductivity Inst I.RV Electronetric Method (Ref: CHI-PH-R*003) PH 0.62 Laboratory Method (Ref: CHI-PH-R*003) Dits I.RV Electronetric Method (Ref: CHI-PH-R*003) PH 0.62 mg/L 0.62 Laboratory Method (Ref: CHI-PH-R*003) Dits Dits Dits Report Status 8.24 unit N/A Electronetric Method Refort Status Sodium Magnesium 65.12 mg/L 0.3 Ion Chromatographic Method Sodium 23.85 mg/L 0.3 Ion Chromatographic Method Sufface 89.75 mg/L 0.3 Ion Chromatographic Method Sufface 89.76 mg/L 0.3	Sampled By Sampled By Sampled By Sample Recieved On Sample Recieved On <th< th=""></th<>
ComponentResultUnitsLRVElectrical Conductivity 1671 Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004)PH N/A Electrometric Method (Ref: CHI-PH-R*003) N/A Electrometric Method (Ref: CHI-PH-R*003)Calcium 8.24 unit N/A Electrometric Method (Ref: CHI-PH-R*003)Magnesium 62.12 mg/L 0.3 Ion Chromatographic MethodMagnesium 67.12 mg/L 0.3 Ion Chromatographic MethodSodium 148.81 mg/L 0.3 Ion Chromatographic MethodPotassium 23.85 mg/L 0.3 Ion Chromatographic MethodSodium 347.55 mg/L 0.3 Ion Chromatographic MethodChloride 89.76 mg/L 0.3 Ion Chromatographic MethodSulfate 89.76 mg/L 0.3 Ion Chromatographic MethodCarborate 347.55 mg/L 0.5 Ion Chromatographic Method	Units LRV Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004) unit N/A Electrometric Method (Ref: CHI-PH-R*003)
Electrical Conductivity 1671 Us/cm 0.62 pH 8.24 unit N/A $calcium$ 62.12 mg/L 0.3 Magnesium 67.12 mg/L 0.3 Nagnesium 148.81 mg/L 0.3 Potassium 23.85 mg/L 0.3 Chloride 347.55 mg/L 0.3 Sulfate 89.76 mg/L 0.3	Us/cm 0.62 unit N/A
Electrical Conductivity 1671 Us/cm 0.62 pH wit N/A pH 8.24 wit N/A Calcium 62.12 mg/L 0.3 Magnesium 67.12 mg/L 0.3 Sodium 67.12 mg/L 0.3 Potassium 148.81 mg/L 0.3 Potassium 23.85 mg/L 0.3 Sulfate 89.76 mg/L 0.3 Calonate 347.55 mg/L 0.3	Us/cm 0.62 unit N/A
pH 8.24 unit N/A Calcium 62.12 mg/L 0.3 Magnesium 67.12 mg/L 0.3 Magnesium 67.12 mg/L 0.3 Sodium 148.81 mg/L 0.3 Potassium 23.85 mg/L 0.3 Chloride 347.55 mg/L 0.3 Sulfate 89.76 mg/L 0.3 Carbonate <35 mg/L 0.3	unit N/A
Calcium 62.12 mg/L 0.3 Magnesium 67.12 mg/L 0.3 Sodium 67.12 mg/L 0.3 Sodium 148.81 mg/L 0.3 Potassium 23.85 mg/L 0.3 Chloride 347.55 mg/L 0.3 Sulfate 89.76 mg/L 0.3 Carbonate <35 mo/L 0.3	Th
Magnesium 67.12 mg/L 0.3	mg/L 0.3
Sodium 148.81 mg/L 0.3 Potassium 23.85 mg/L 0.3 Chloride 347.55 mg/L 0.5 Sulfate 89.76 mg/L 0.3 Carbonate <3.5 mo/L 0.3	mg/L 0.3
Potassium 23.85 mg/L 0.3 Chloride 347.55 mg/L 0.5 Sulfate 89.76 mg/L 0.3 Carbonate <3.5 mo/L 0.3	mg/L 0.3
Chloride 347.55 mg/L 0.5 Sulfate 89.76 mg/L 0.3 Carbonate <3.5 mo/L 0.3	mg/L 0.3
Sulfate $89.76 \text{ mg/L} 0.3$ Carbonate $<3.5 \text{ mo/L} 2.5$	mg/L 0.5
Carbonate <3.5 mo/l. 2.5	mg/L 0.3
	<3.5 mg/L 3.5 Titrimetric Method
^N Bicarbonate 291.58 mg/L 8.5 Titrimetric Method	mg/L 8.5
^{N} Nitrate 31.8 mg/L 0.2 Ion Chromatographic	mg/L 0.2
^N Hardness 431 mg/L As CaCO3 5 EDTA Titrimetric Method	mg/L As CaCO3 5

			lest	Analysis 1 est keport	Anuma u Direct, Diader Waa 1258en (next to Civit Dejence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196916	Lab Ref.	200196916	
Submission No : 100068789 Location Description : 19 -13 / 50 A Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 13:30:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	1679	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.25	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	33)
N Calcium	58.52	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	68.46	mg/L	0.3	Ion Chromatographic Method	
N Sodium	152.72	mg/L	0.3	Ion Chromatographic Method	
N Potassium	24.24	mg/L	0.3	Ion Chromatographic Method	
N Chloride	345.42	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	87.36	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	280.6	mg/L	8.5	Titrimetric Method	
N Nitrate	30.98	mg/L	0.2	Ion Chromatographic	
N Hardness	427	mg/L As CaCO3	5	EDTA Titrimetric Method	

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Al-Manara Universal Co.		Analysis Test Report	Test	Report	Laboratories and Quany Department, water Authority of Joraan Khansa'a Street, Biader Wadi Esseer (next to Civit Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196917	Lab Ref.	200196917	
Submission No : 100068789 Location Description : 19 -13 / 26 A Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 13:45:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	4900	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.12	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	03)
N Calcium	137.47	mg/L	0.3	Ion Chromatographic Method	
N Magnesium	175.71	mg/L	0.3	Ion Chromatographic Method	
N Sodium	640.55	mg/L	0.3	Ion Chromatographic Method	
N Potassium	82.89	mg/L	0.3	Ion Chromatographic Method	
N Chloride	1294.69	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	229.44	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	360.51	mg/L	8.5	Titrimetric Method	
N Nitrate	33.37	mg/L	0.2	Ion Chromatographic	
N Hardness	1066	mg/L As CaCO3	5	EDTA Titrimetric Method	

Al-Manara Universal Co.		Analysis Test Report	Test	Report	Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196918	Lab Ref.	200196918	
Submission No : 100068789 Location Description : 19 -13 / 26 A Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 14:00:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	4840	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.16	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	33)
N Calcium	114.83	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	163.92	mg/L	0.3	Ion Chromatographic Method	
N Sodium	618.93	mg/L	0.3	Ion Chromatographic Method	
N Potassium	78.98	mg/L	0.3	Ion Chromatographic Method	
N Chloride	1314.57	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	203.04	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	664.29	mg/L	8.5	Titrimetric Method	
N Nitrate	27.12	mg/L	0.2	Ion Chromatographic	
N Hardness	960	mg/L As CaCO3	5	EDTA Titrimetric Method	

Page 17 of 28

		Analysis Test Report	Test	Report	Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail htfo-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196919	Lab Ref.	200196919	
Submission No : 100068789 Location Description : 19 -13 / 26 A Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 14:15:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	4950	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.10	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	03)
N Calcium	117.84	mg/L	0.3	Ion Chromatographic Method	
^N Magnesium	166.35	mg/L	0.3	Ion Chromatographic Method	
N Sodium	630.66	mg/L	0.3	Ion Chromatographic Method	
N Potassium	81.33	mg/L	0.3	Ion Chromatographic Method	
N Chloride	1372.43	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	208.8	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	332.45	mg/L	8.5	Titrimetric Method	
N Nitrate	27.21	mg/L	0.2	Ion Chromatographic	
N Hardness	978	mg/L As CaCO3	5	EDTA Titrimetric Method	

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		Analysis Test Report	Test	Report	Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
		Sample No & Lab Ref. 200196920	Lab Ref	200196920	
Submission No : 100068789 Location Description : 19 -13 / 26 Jericho				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 03-AUG-2008 14:30:00 Routine
Component	Result	Units	LRV		Method Used
A Electrical Conductivity	4970	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
A pH	8.12	unit	N/A	Electrometric Method (Ref: CHI-PH-R*003)	03)
N Calcium	94.99	mg/L	0.3	Ion Chromatographic Method	
N Magnesium	140.2	mg/L	0.3	Ion Chromatographic Method	
N Sodium	589.03	mg/L	0.3	Ion Chromatographic Method	
N Potassium	59.04	mg/L	0.3	Ion Chromatographic Method	
N Chloride	1111.15	mg/L	0.5	Ion Chromatographic Method	
N Sulfate	193.92	mg/L	0.3	Ion Chromatographic Method	
N Carbonate	<3.5	mg/L	3.5	Titrimetric Method	
N Bicarbonate	358.07	mg/L	8.5	Titrimetric Method	
N Nitrate	49.88	mg/L	0.2	Ion Chromatographic	
N Hardness	813	mg/L As CaCO3	5	EDTA Titrimetric Method	

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	Attention :- Al-Manara Universal Co.		Analysis Test Report	Test]	Report	Laboratories and Quality Department / Water Authority of Jordan Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
ubmission No : 10068789 ocation Description : Isonof Receved On : Isonof Returned Receved On ocation Description : Isonof Returned Receved On : Isonof Returned Receved On component Result Units : Isonof Returned Receved On component Result Units : Isonof Returned Receved On component Result Units : Isonof Returned Receved On pH : Isonof Returned Return			Sample No &	Lab Ref.	200196921	
ComponentResultUnitsLRVElectrical Conductivity1760Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004)pH7.98unitN/AElectrometric Method (Ref: CHI-PH-R*003)calcium 85.77 mg/L 0.3 Ion Chromatographic MethodMagnesium 64.45 mg/L 0.3 Ion Chromatographic MethodSodium 64.45 mg/L 0.3 Ion Chromatographic MethodNagnesium 152.26 mg/L 0.3 Ion Chromatographic MethodSodium 152.26 mg/L 0.3 Ion Chromatographic MethodPotassium 152.26 mg/L 0.3 Ion Chromatographic MethodChloride 18.47 mg/L 0.3 Ion Chromatographic MethodSulfate 0.3 Ion Chromatographic Method 0.3 Ion Chromatographic MethodChloride 18.47 mg/L 0.3 Ion Chromatographic MethodSulfate 242.78 mg/L 3.5 Titrimetric MethodNitrate 15.43 mg/L 0.2 Ion Chromatographic MethodNitrate 15.43 mg/L 3.6 In Chromatographic MethodNitrate 15.43 mg/L 0.2 Ion ChromatographicNitrate 15.43 mg/L 0.2 </th <th>Submission No : 100068789 Location Description : Jericho 1</th> <th></th> <th></th> <th></th> <th>Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status</th> <th> E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 24-AUG-2008 06:00:00 Routine </th>	Submission No : 100068789 Location Description : Jericho 1				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 24-AUG-2008 06:00:00 Routine
Electrical Conductivity 1760 Us/cm 0.62 pH 7.98 unit N/A $calcium$ 85.77 mg/L 0.3 Magnesium 85.77 mg/L 0.3 Magnesium 64.45 mg/L 0.3 Sodium 152.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Sodium 135.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Sulfate 3.5 mg/L 0.3 Chloride 242.78 mg/L 0.3 Sulfate 242.78 mg/L 0.2 Nitrate 15.43 mg/L 0.2 Nitrate 15.43 mg/L 0.2 Hardness 479 mg/L As CaCO3 5	Component	Result	Units	LRV		Method Used
Electrical Conductivity 1760 Us/cm 0.62 pH 7.98 unit N/A $Calcium$ 85.77 mg/L 0.3 Magnesium 85.77 mg/L 0.3 Magnesium 64.45 mg/L 0.3 Sodium 152.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Orloride $14.8.55$ mg/L 0.3 Sulfate 418.55 mg/L 0.3 Chloride 43.68 mg/L 0.3 Sulfate 63.5 mg/L 0.3 Sulfate 242.78 mg/L 0.3 Nitrate 15.43 mg/L 0.3 Matchess 479 mg/L 0.2						
pH 7.98 unit N/A Calcium 85.77 mg/L 0.3 Kagnesium 85.77 mg/L 0.3 Magnesium 64.45 mg/L 0.3 Sodium 152.26 mg/L 0.3 Potassium 152.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 418.55 mg/L 0.3 Sulfate 43.68 mg/L 0.3 Chorate 243.78 mg/L 0.3 Sulfate 242.78 mg/L 0.3 Bicarbonate 15.43 mg/L 0.3 Nitrate 15.43 mg/L 0.2		1760	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)	
Calcium 85.77 mg/L 0.3 Magnesium 64.45 mg/L 0.3 Sodium 152.26 mg/L 0.3 Potassium 152.26 mg/L 0.3 Potassium 152.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 418.55 mg/L 0.5 Sulfate 43.68 mg/L 0.5 Carbonate 43.68 mg/L 0.3 Bicarbonate $c3.5$ mg/L 8.5 Nitrate 15.43 mg/L 8.5 Matchess 479 mg/L 8.5		7.98	unit	N/A	Electrometric Method (Ref: CHI-PH-R*0	(3)
Magnesium 64.45 mg/L 0.3 Sodium 152.26 mg/L 0.3 Potassium 154.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 418.55 mg/L 0.5 Sulfate 43.68 mg/L 0.5 Sulfate 23.5 mg/L 0.3 Carbonate <3.5 mg/L 0.3 Bicarbonate 242.78 mg/L 8.5 Nitrate 15.43 mg/L 8.5 Mardness 479 mg/L 8.5		85.77	mg/L	0.3	Ion Chromatographic Method	
Sodium 152.26 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 14.47 mg/L 0.3 Chloride 418.55 mg/L 0.5 Sulfate 43.68 mg/L 0.5 Sulfate 43.68 mg/L 0.3 Carbonate <3.5 mg/L 0.3 Sulfate 242.78 mg/L 8.5 Bicarbonate 15.43 mg/L 8.5 Nitrate 15.43 mg/L 0.2		64.45	mg/L	0.3	Ion Chromatographic Method	
Potassium 14.47 mg/L 0.3 Chloride 418.55 mg/L 0.5 Chloride 418.55 mg/L 0.5 Sulfate 43.68 mg/L 0.5 Carbonate 43.68 mg/L 0.3 Discrbonate <3.5 mg/L 3.5 Bicarbonate 242.78 mg/L 8.5 Nitrate 15.43 mg/L 8.5 Hardness 479 mg/L As CaCO3 5		152.26	mg/L	0.3	Ion Chromatographic Method	
Chloride 418.55 mg/L 0.5 Sulfate 43.68 mg/L 0.3 Carbonate <3.5 mg/L 0.3 Discrbonate <3.5 mg/L 0.3 Nitrate 15.43 mg/L 8.5 Hardness 479 mg/L 8.5		14.47	mg/L	0.3	Ion Chromatographic Method	
Sulfate 43.68 mg/L 0.3 Carbonate <3.5 mg/L 3.5 Bicarbonate $<3.242.78$ mg/L 8.5 Nitrate 15.43 mg/L 0.2 Hardness 479 mg/L As CaCO3 5		418.55	mg/L	0.5	Ion Chromatographic Method	
Carbonate <3.5 mg/L 3.5 Bicarbonate 242.78 mg/L 8.5 Nitrate 15.43 mg/L 0.2 Hardness 479 mg/L As CaCO3 5		43.68	mg/L	0.3	Ion Chromatographic Method	
Bicarbonate 242.78 mg/L 8.5 Nitrate 15.43 mg/L 0.2 Hardness 479 mg/L As CaCO3 5		<3.5	mg/L	3.5	Titrimetric Method	
Nitrate15.43mg/L0.2Hardness 479 mg/L As CaCO3 5		242.78	mg/L	8.5	Titrimetric Method	
Hardness 479 mg/L As CaCO3 5		15.43	mg/L	0.2	Ion Chromatographic	
		479	mg/L As CaCO3	5	EDTA Titrimetric Method	

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INOSample No & Lab Ref.Sample No & Lab Ref.Sample No & Lab Ref.cerciption : Jericho 1ComponentResultConductivity 1743 Us/cm0.62 7.17 0.62 1743 0.62 1743 0.62 1743 0.62 1.743 0.62 $1.144.7$ 0.62 <th co<="" th=""><th>Attention :- Al-Manara Universal Co.</th><th></th><th>Analysis Test Report</th><th>Test]</th><th>Report</th><th>Laboratories and Quality Department / Water Authority of Jordan Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com</th></th>	<th>Attention :- Al-Manara Universal Co.</th> <th></th> <th>Analysis Test Report</th> <th>Test]</th> <th>Report</th> <th>Laboratories and Quality Department / Water Authority of Jordan Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com</th>	Attention :- Al-Manara Universal Co.		Analysis Test Report	Test]	Report	Laboratories and Quality Department / Water Authority of Jordan Khansa'a Street, Biader Wadi Esseer (next to Civil Defence Department) Amman 11183 P.O. Box 2412 Jordan Tel +962 6 5864361/2, Fax +962 6 5825275, E-mail Info-wajlabs@yahoo.com
ubmission No: 100063789Sampled By:ocation Description : Jericho 1			Sample No &	Lab Ref.	200196922		
ComponentResultUnitsLRVElectrical Conductivity 1743 Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004)pH N/A Electrometric Method (Ref: CHI-PH-R*003) N/A Electrometric Method (Ref: CHI-PH-R*003)catcium 87.17 mg/L 0.3 Ion Chromatographic MethodMagnesium 87.17 mg/L 0.3 Ion Chromatographic MethodMagnesium 63.6 mg/L 0.3 Ion Chromatographic MethodNotation 14.47 mg/L 0.3 Ion Chromatographic MethodPotassium 14.47 mg/L 0.3 Ion Chromatographic MethodChloride 34.08 mg/L 0.3 Ion Chromatographic MethodSulfate 34.08 mg/L 0.3 Ion Chromatographic MethodSulfate 267.18 mg/L 3.5 Titrimetric MethodNitrate 12.97 mg/L 0.2 Ion Chromatographic MethodNitrate 267.18 mg/L 0.2 Ion Chromatographic MethodNitrate 12.97 mg/L 0.2 Ion Chromatographic MethodNitrate 12.97 mg/L 0.2 Ion Chromatographic MethodHardness 12.97 mg/L 0.2 Ion ChromatographicHardness 12.97 mg/L 0.2 Ion Chromatographic	Submission No : 100068789 Location Description : Jericho 1				Sampled By Sample Recieved On Issue Status&Date Sampling Date Report Status	 E.Majedah Alawna 28-AUG-2008 Complete 25/09/2008 09:54 AM 24-AUG-2008 07:00:00 Routine 	
Electrical Conductivity 1743 Us/cm 0.62 pH 7.98 unit N/A Calcium 87.17 mg/L 0.3 Magnesium 87.17 mg/L 0.3 Sodium 63.6 mg/L 0.3 Potassium 148.35 mg/L 0.3 Sodium 14.47 mg/L 0.3 Sodium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 34.08 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Sulfate 267.18 mg/L 0.3 Nitrate 12.97 mg/L 0.2 Mathess 470 $mo/L.As.CaCO3$ 0.2	Component	Result	Units	LRV		Method Used	
Electrical Conductivity 1743 Us/cm 0.62 pH 7.98 unit N/A $Calcium$ 87.17 mg/L 0.3 Magnesium 87.17 mg/L 0.3 Magnesium 63.6 mg/L 0.3 Sodium 63.6 mg/L 0.3 Potassium 148.35 mg/L 0.3 Sodium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Solutium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Sulfate 267.18 mg/L 0.3 Nitrate 12.97 mg/L 0.2							
pH 7.98 unit N/A Calcium 87.17 mg/L 0.3 Magnesium 87.17 mg/L 0.3 Magnesium 63.6 mg/L 0.3 Sodium 148.35 mg/L 0.3 Potassium 148.35 mg/L 0.3 Potassium 14.47 mg/L 0.3 Sodium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Solitate 34.08 mg/L 0.3 Chloride 34.08 mg/L 0.3 Sulfate 267.18 mg/L 0.3 Sulfate 267.18 mg/L 0.3 Nitrate 12.97 mg/L 0.2		1743	Us/cm	0.62	Laboratory Method (Ref: CHI-EC-R*004)		
Calcium 87.17 mg/L 0.3 Magnesium 63.6 mg/L 0.3 Sodium 63.6 mg/L 0.3 Sodium 148.35 mg/L 0.3 Potassium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 34.08 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Chloride 34.08 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Sulfate 267.18 mg/L 3.5 Bicarbonate 267.18 mg/L 3.5 Nitrate 12.97 mg/L 0.2	A pH	7.98	unit	N/A	Electrometric Method (Ref: CHI-PH-R*0	33)	
Magnesium 63.6 mg/L 0.3 Sodium 148.35 mg/L 0.3 Potassium 148.35 mg/L 0.3 Potassium 148.35 mg/L 0.3 Potassium 148.35 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 426.36 mg/L 0.5 Sulfate 34.08 mg/L 0.5 Sulfate 34.08 mg/L 0.5 Sulfate 267.18 mg/L 8.5 Bicarbonate 12.97 mg/L 8.5 Nitrate 12.97 mg/L 0.2		87.17	mg/L	0.3	Ion Chromatographic Method		
Sodium 148.35 mg/L 0.3 Potassium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 426.36 mg/L 0.3 Sulfate 34.08 mg/L 0.5 Sulfate 34.08 mg/L 0.3 Carbonate <3.5 mg/L 3.5 Bicarbonate 267.18 mg/L 3.5 Nitrate 12.97 mg/L 0.2		63.6	mg/L	0.3	Ion Chromatographic Method		
Potassium 14.47 mg/L 0.3 Chloride 426.36 mg/L 0.5 Sulfate 34.08 mg/L 0.5 Sulfate 34.08 mg/L 0.3 Carbonate <3.5 mg/L 0.3 Bicarbonate <567.18 mg/L 8.5 Nitrate 12.97 mg/L 0.2 Hardness 479 $mo/L.As.CaCO3$ c_2		148.35	mg/L	0.3	Ion Chromatographic Method		
Chloride 426.36 mg/L 0.5 Sulfate 34.08 mg/L 0.3 Sulfate 34.08 mg/L 0.3 Carbonate <3.5 mg/L 0.3 Bicarbonate <5.5 mg/L 3.5 Nitrate 12.97 mg/L 8.5 Hardness 479 mo/L As CaCO3 c		14.47	mg/L	0.3	Ion Chromatographic Method		
Sulfate 34.08 mg/L 0.3 Carbonate <3.5 mg/L 3.5 Bicarbonate <57.18 mg/L 3.5 Nitrate 12.97 mg/L 0.2 Hardness 479 $mo/L \ As CaOO3$ 6		426.36	mg/L	0.5	Ion Chromatographic Method		
Carbonate <3.5 mg/L 3.5 Bicarbonate 267.18 mg/L 8.5 Nitrate 12.97 mg/L 0.2 Hardness 479 mo/L As CaCO3 5		34.08	mg/L	0.3	Ion Chromatographic Method		
Bicarbonate 267.18 mg/L 8.5 Nitrate 12.97 mg/L 0.2 Hardness 479 mo/L As CaCO3 5		<3.5	mg/L	3.5	Titrimetric Method		
Nitrate 12.97 mg/L 0.2 Hardness 479 mg/L As CaCO3 5		267.18	mg/L	8.5	Titrimetric Method		
Hardness 479 mo/L As CaCO3 5		12.97	mg/L	0.2	Ion Chromatographic		
	N Hardness	479	mg/L As CaCO3	5	EDTA Titrimetric Method		

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Sample No & Lab Ref. 200196923 m No : 100068789 Description : Jericho NO.1 After 3 hrs pumping Sample By Description : Jericho NO.1 After 3 hrs pumping Sample By Description : Jericho NO.1 After 3 hrs pumping Sample By Description : Jericho NO.1 After 3 hrs pumping Sample Recieved On : Issue Status&Date : Sampling Date : S	Sample No & Lab Ref. 200196923 Sampled By : Sample Recieved On : Sample Recieved On : Issue Status&Date : Sampling Date : Units LRV Us/cm 0.62 Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004) unit N/A
Sampled By Sampled By Sampled By Sampled By Sample Recieved On Sample Recieved On Sampling Date Sampling Date <th>Sampled By : Sample Recieved On : Sample Recieved On : Issue Status&Date : Sampling Date : Issue Status : <</th>	Sampled By : Sample Recieved On : Sample Recieved On : Issue Status&Date : Sampling Date : Issue Status : <
ComponentResultUnitsLRVElectrical Conductivity 1731 $U_{\rm S}/{\rm cm}$ $L_{\rm aboratory}$ Method (Ref: CHI-EC-R*004)PH 0.62 Laboratory Method (Ref: CHI-FH-R*003)PH 8.03 unit N/A Electrometric Method (Ref: CHI-PH-R*003)Calcium 8.03 unit N/A Electrometric Method (Ref: CHI-PH-R*003)Magnesium 80.36 mg/L 0.3 Ion Chromatographic MethodMagnesium 64.2 mg/L 0.3 Ion Chromatographic MethodSodium 150.65 mg/L 0.3 Ion Chromatographic MethodPotassium 14.47 mg/L 0.3 Ion Chromatographic MethodChloride 447.66 mg/L 0.5 Ion Chromatographic MethodChoride 0.5 mg/L 0.5 Ion Chromatographic Method	Units LRV Us/cm 0.62 Laboratory Method (Ref: CHI-EC-R*004) unit N/A Electrometric Method (Ref: CHI-PH-R*003)
Electrical Conductivity 1731 Us/cm 0.62 pH 8.03 unit N/A calcium 8.03 unit N/A Calcium 8.036 mg/L 0.3 Magnesium 64.2 mg/L 0.3 Sodium 150.65 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.5	Us/cm 0.62 unit N/A
Electrical Conductivity 1731 $U_{S/Cm}$ 0.62 pH 8.03 unit N/A claitum 8.03 unit N/A Calcium 8.036 mg/L 0.3 Magnesium 64.2 mg/L 0.3 Sodium 150.65 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.3	Us/cm 0.62 unit N/A
	unit N/A
Calcium 80.36 mg/L 0.3 Magnesium 64.2 mg/L 0.3 Magnesium 150.65 mg/L 0.3 Sodium 14.47 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.5	
Magnesium 64.2 mg/L 0.3 Sodium 150.65 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.5	mg/L 0.3
Sodium 150.65 mg/L 0.3 Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.5	mg/L 0.3
Potassium 14.47 mg/L 0.3 Chloride 447.66 mg/L 0.5	mg/L 0.3
Chloride 447.66 mg/L 0.5	mg/L 0.3
	mg/L 0.5
Sulfate 53.32 mg/L 0.3	mg/L 0.3 Ion Chromatographic Method
^N Carbonate <3.5 mg/L 3.5 Titrimetric Method	mg/L 3.5
mg/L	mg/L 8.5
^{N} Nitrate 13.09 mg/L 0.2 Ion Chromatographic	mg/L 0.2
^N Hardness 464 mg/L As CaCO3 5 EDTA Titrimetric Method	5

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