

Table I-2-37 Estimation of Net Income (Wheat)

Financial		Financial Price: LE Crop: Wheat						W/Proj WO/Proj		Area 315800 295500		% Share 28 28		CropArea 88424 82740	
Item	Price/Unit	Qty WO/Proj	F Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	F Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4				
INCOME															
Main	53\$/ton	2.1	1341.90	2.27	2.33	2.30	2.42	1449.25	1489.51	1529.77	1543.19				
By Product	20\$/aed	11.2	224.00	12.10	12.43	12.77	12.88	242.00	248.60	255.40	257.60				
PROD COST															
NonYield Dependent															
Seed	.53/kg	50	31.50	50.00	50.00	50.00	50.00	31.50	31.50	31.50	31.50				
Manure	2.8/m3	15	39.00	15	15	15	15	39.00	39.00	39.00	39.00				
Fertilizer															
N	1.1/kg	70	77.00	70	70	70	70	77.00	77.00	77.00	77.00				
P2O5	1.25/kg	30	37.50	30	30	30	30	37.50	37.50	37.50	37.50				
K	1.04/kg	40	41.60	40	40	40	40	41.60	41.60	41.60	41.60				
Other															
Insect/d	8.95/liter	15	149.25	15	15	15	15	149.25	149.25	149.25	149.25				
Fungic/d	30/liter	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Herbic/d	15/liter	2	30.00	1.00	1.00	1.00	1.00	15.00	15.00	15.00	15.00				
Machinery															
Land Prep	10/hr	2.5	25.00	2.5	2.5	2.5	2.5	25.00	25.00	25.00	25.00				
Spraying	5/hr	2	10.00	2	2	2	2	10.00	10.00	10.00	10.00				
Irri/gate	10/hr	20	200.00	20	20	20	20	200.00	200.00	200.00	200.00				
Animal															
Cultivatn	10/hr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Transp'n	5/hr	45	225.00	45	45	45	45	225.00	225.00	225.00	225.00				
Labor															
Family	1.2/hr	61	73.20	61	61	61	61	73.20	73.20	73.20	73.20				
Hired	1.2/hr	61	73.20	61	61	61	61	73.20	73.20	73.20	73.20				
Yield Dep'd															
Machinery															
Threshing	25/hr	2.7	67.50	2.92	3.00	3.08	3.11	73.00	75.00	77.00	77.75				
Winnowin	25/hr	2.4	60.00	2.59	2.74	2.74	2.76	64.75	68.50	68.50	69.00				
Animal															
Transp'n	5/hr	30	150.00	32.40	33.30	34.20	34.50	162.00	166.50	171.00	172.50				
Labor															
Family	1.2/hr	45	54.00	48.60	49.95	51.30	51.75	58.32	59.94	61.56	62.10				
Hired	1.2/hr	45	54.00	48.60	49.95	51.30	51.75	58.32	59.94	61.56	62.10				
TOTAL	LE/aed		1397.75					1413.64	1427.13	1436.87	1440.70				
NET INCOME(LE/aed)			168.15					277.61	310.98	348.30	360.09				
OMQUM AREA NET INCOME(MB LE)			13.91								31.84				
GROSS INCOME			129.56								159.23				
PRODUCTION COST			115.65								127.39				

Notes: Income=(Yield/aed)*(Price/unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/aed/aed
 Cost of Production=(Quantity/aed)*(Price/unit)
 Net Income=Gross Income - Production Costs
 OMQUM Net Income=Crop Share(%)*Potential Development Area*(Net Income/aed)

Economic

Economic		Economic Price: LE Crop: Wheat						W/Proj WO/Proj		Area 315800 295500		% Share 28 28		CropArea 88424 82740	
Item	Price/Unit	Qty WO/Proj	E Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	E Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4				
INCOME															
Main	826\$/ton	2.1	1734.60	2.27	2.33	2.30	2.42	1873.37	1925.41	1977.44	1994.79				
By Product	20\$/aed	11.2	224.00	12.10	12.43	12.77	12.88	242.00	248.60	255.40	257.60				
PROD COST															
NonYield Dependent															
Seed	1.22/kg	50	61.00	50.00	50.00	50.00	50.00	61.00	61.00	61.00	61.00				
Manure	2.8/m3	15	39.00	15	15	15	15	39.00	39.00	39.00	39.00				
Fertilizer															
N	1.6/kg	70	112.00	70	70	70	70	112.00	112.00	112.00	112.00				
P2O5	1.5/kg	30	45.00	30	30	30	30	45.00	45.00	45.00	45.00				
K	1.3/kg	40	52.00	40	40	40	40	52.00	52.00	52.00	52.00				
Other															
Insect/d	8.95/liter	15	149.25	15	15	15	15	149.25	149.25	149.25	149.25				
Fungic/d	30/liter	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Herbic/d	15/liter	2	30.00	1.00	1.00	1.00	1.00	15.00	15.00	15.00	15.00				
Machinery															
Land Prep	10/hr	2.5	25.00	2.5	2.5	2.5	2.5	25.00	25.00	25.00	25.00				
Spraying	5/hr	2	10.00	2	2	2	2	10.00	10.00	10.00	10.00				
Irri/gate	10/hr	20	200.00	20	20	20	20	200.00	200.00	200.00	200.00				
Animal															
Cultivatn	10/hr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Transp'n	5/hr	45	225.00	45	45	45	45	225.00	225.00	225.00	225.00				
Labor															
Family	1.2/hr	61	73.20	61	61	61	61	73.20	73.20	73.20	73.20				
Hired	1.2/hr	61	73.20	61	61	61	61	73.20	73.20	73.20	73.20				
Yield Dep'd															
Machinery															
Threshing	25/hr	2.7	67.50	2.92	3.00	3.08	3.11	73.00	75.00	77.00	77.75				
Winnowin	25/hr	2.4	60.00	2.59	2.74	2.74	2.76	64.75	68.50	68.50	69.00				
Animal															
Transp'n	5/hr	30	150.00	32.40	33.30	34.20	34.50	162.00	166.50	171.00	172.50				
Labor															
Family	1.2/hr	45	54.00	48.60	49.95	51.30	51.75	58.32	59.94	61.56	62.10				
Hired	1.2/hr	45	54.00	48.60	49.95	51.30	51.75	58.32	59.94	61.56	62.10				
TOTAL	LE/aed		1480.15					1498.04	1509.53	1519.27	1523.10				
NET INCOME(LE/aed)			478.45					619.33	684.48	713.57	729.29				
OMQUM AREA NET INCOME(MB LE)			39.89								64.49				
GROSS INCOME			162.05								199.17				
PRODUCTION COST			122.47								134.88				

Table I-2-38 Estimation of Net Income (Beans)

Financial	Item	Price/Unit	Financial Price: LE		1283		W/Proj	Area	% Share	CropArea	Y1:Y4	
			QTY	F Value	QTY	With	Project	WO/Proj	315000	5		16790
			WO/Proj	Beans	Yr1	Yr2	Yr3	Area	% Share	CropArea	Yr4	
			WO/Proj	Beans	Yr1	Yr2	Yr3	295500	5	14775	Yr4	
INCOME												
Main	1283/ton		0.8525	1093.78	0.94	0.98	1.00	1.02	1203.13	1258.82	1280.69	1312.51
By Product	15/hoad		4.2	63.00	4.62	4.83	4.91	5.04	69.30	72.45	73.65	75.60
PROD COST												
NonYield Dependent												
Seed	1.45/kg		60	87.00	60	60	60	60	87.00	87.00	87.00	87.00
Manure	2.6/m3		20	52.00	20	20	20	20	52.00	52.00	52.00	52.00
Fertilizer												
N	1.1/kg		15.5	17.05	15.5	15.5	15.5	15.5	17.05	17.05	17.05	17.05
P2O5	1.25/kg		15	18.75	15	15	15	15	19.38	19.38	19.38	19.38
K	1.04/kg		30	31.20	30	30	30	30	31.20	31.20	31.20	31.20
Other												
Insectic'd	9.95/liter		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Fungic'd	30/liter		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Herbic'd	15/liter		2	30.00	2	2	2	2	30.00	30.00	30.00	30.00
Machinery												
Land Prep	10/hr		3	30.00	3	3	3	3	30.00	30.00	30.00	30.00
Spraying	5/hr		4	20.00	4	4	4	4	20.00	20.00	20.00	20.00
Imga'n	10/hr		16	160.00	16	16	16	16	160.00	160.00	160.00	160.00
Animal												
Cultiva'n	10/hr		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Transp'n	5/hr		30	15.00	30	30	30	30	150.00	150.00	150.00	150.00
Labor												
Family	1.2/hr		34	40.80	34	34	34	34	40.80	40.80	40.80	40.80
Hired	1.2/hr		34	40.80	34	34	34	34	40.80	40.80	40.80	40.80
Yield Dep'd												
Machinery												
Thrashing	25/hr		2	50.00	2.20	2.30	2.34	2.40	55.00	57.50	58.50	60.00
Winnow'n	25/hr		2.4	60.00	2.64	2.76	2.81	2.88	66.00	69.00	70.25	72.00
Animal												
Transp'n	5/hr		18	90.00	19.80	20.70	21.06	21.60	99.00	103.50	105.30	108.00
Labor												
Family	1.2/hr		47.64	57.17	52.40	54.79	55.74	57.17	62.88	65.75	66.89	68.60
Hired	1.2/hr		47.64	57.17	52.40	54.79	55.74	57.17	62.88	65.75	66.89	68.60
TOTAL	LE/led			856.94					1023.99	1039.72	1046.05	1055.43
NET INCOME(LE/led)				298.82					248.45	291.54	308.29	332.68
OMDUM AREA NET INCOME(MM LE)				4.43								5.25
GROSS INCOME				17.09								21.92
PRODUCTION COST				12.66								16.67

Notes: Income=(Yield/led)*(Price/Unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/led/ha
 Cost of Production=(Quantity/led)*(Price/Unit)
 Net Income=Gross Income - Production Costs
 Omdum Net Income=Crop Share(%)*Potential Development Area*(Net Income/led)

Economic	Item	Price/Unit	E Price: LE		1283		W/Proj	Area	% Share	CropArea	Y1:Y4	
			QTY	E Value	QTY	With	Project	WO/Proj	315000	5		16790
			WO/Proj	Beans	Yr1	Yr2	Yr3	Area	% Share	CropArea	Yr4	
			WO/Proj	Beans	Yr1	Yr2	Yr3	295500	5	14775	Yr4	
INCOME												
Main	1283/ton		0.8525	1093.78	0.94	0.98	1.00	1.02	1203.13	1258.82	1280.69	1312.51
By Product	15/hoad		4.2	63.00	4.62	4.83	4.91	5.04	69.30	72.45	73.65	75.60
PROD COST												
NonYield Dependent												
Seed	2.52/kg		60	151.20	60	60	60	60	151.20	151.20	151.20	151.20
Manure	2.6/m3		20	52.00	20	20	20	20	52.00	52.00	52.00	52.00
Fertilizer												
N	1.6/kg		15.5	24.80	15.5	15.5	15.5	15.5	24.80	24.80	24.80	24.80
P2O5	1.5/kg		15	22.50	15	15	15	15	23.25	23.25	23.25	23.25
K	1.3/kg		30	39.00	30	30	30	30	39.00	39.00	39.00	39.00
Other												
Insectic'd	9.95/liter		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Fungic'd	30/liter		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Herbic'd	15/liter		2	30.00	2	2	2	2	30.00	30.00	30.00	30.00
Machinery												
Land Prep	10/hr		3	30.00	3	3	3	3	30.00	30.00	30.00	30.00
Spraying	5/hr		4	20.00	4	4	4	4	20.00	20.00	20.00	20.00
Imga'n	10/hr		16	160.00	16	16	16	16	160.00	160.00	160.00	160.00
Animal												
Cultiva'n	10/hr		0	0.00	0	0	0	0	0.00	0.00	0.00	0.00
Transp'n	5/hr		30	15.00	30	30	30	30	150.00	150.00	150.00	150.00
Labor												
Family	1.2/hr		34	40.80	34	34	34	34	40.80	40.80	40.80	40.80
Hired	1.2/hr		34	40.80	34	34	34	34	40.80	40.80	40.80	40.80
Yield Dep'd												
Machinery												
Thrashing	25/hr		2	50.00	2.20	2.30	2.34	2.40	55.00	57.50	58.50	60.00
Winnow'n	25/hr		2.4	60.00	2.64	2.76	2.81	2.88	66.00	69.00	70.25	72.00
Animal												
Transp'n	5/hr		18	90.00	19.80	20.70	21.06	21.60	99.00	103.50	105.30	108.00
Labor												
Family	1.2/hr		47.64	57.17	52.40	54.79	55.74	57.17	62.88	65.75	66.89	68.60
Hired	1.2/hr		47.64	57.17	52.40	54.79	55.74	57.17	62.88	65.75	66.89	68.60
TOTAL	LE/led			940.44					1107.61	1123.35	1129.68	1130.06
NET INCOME(LE/led)				216.32					164.62	207.92	224.86	249.05
OMDUM AREA NET INCOME(MM LE)				3.20								3.93
GROSS INCOME				17.09								21.92
PRODUCTION COST				13.89								17.99

Table I-2-39 Estimation of Net Income (L. Berseem)

Financial		F Price Crop		61 L Berseem		W/Proj WO/Proj		Area 31500 Area 295500		% Share 15 % Share 15		CropArea 47370 CropArea 44325	
Item	Price/Unit	Qty WO/Proj	F Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	F Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4		
INCOME													
Main By Product	81/ton	25.00	1525.00	27.50	28.75	29.25	30.00	1677.50	1753.75	1784.25	1830.00		
PROD COST													
NonYield D:													
Seed	2.06/kg	25.00	51.50	25.00	25.00	25.00	25.00	51.50	51.50	51.50	51.50		
Manure	2.6/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fertilizer													
N	1.1/kg	15.00	16.50	15.00	15.00	15.00	15.00	16.50	16.50	16.50	16.50		
P2O5	1.25/kg	20.00	25.00	20.00	20.00	20.00	20.00	25.00	25.00	25.00	25.00		
K	1.04/kg	75.00	78.00	75.00	75.00	75.00	75.00	78.00	78.00	78.00	78.00		
Other													
Insectic'd	9.95/liter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95		
Fungic'd	30/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	2.50	25.00	2.50	2.50	2.50	2.50	25.00	25.00	25.00	25.00		
Spraying	5/hr	2.00	10.00	2.00	2.00	2.00	2.00	10.00	10.00	10.00	10.00		
Irrigat'n	10/hr	30.00	300.00	30.00	30.00	30.00	30.00	300.00	300.00	300.00	300.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	30.00	150.00	30.00	30.00	30.00	30.00	150.00	150.00	150.00	150.00		
Labor													
Family	1.2/hr	60.00	72.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Hired	1.2/hr	60.00	72.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnow'n	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	72.00	86.40	72.00	82.80	84.24	86.40	0.00	0.00	0.00	0.00		
Hired	1.2/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	LE/ed		896.35					809.95	809.95	809.95	808.85		
NET INCOME (LE/ed)			628.65					867.55	943.80	974.30	1020.05		
OMOUM AREA NET INCOME (Mill LE)			27.86								48.32		
GROSS INCOME			67.60								86.89		
PRODUCTION COST			39.73								38.37		

Notes: Income=(Yield/ed)*(Price/unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/edden
 Cost of Production=(Quantity/ed)*(Price/unit)
 Net Income=Gross Income - Production Costs
 Omoum Net Income=Crop Share(%)*Potential Development Area*(Net Income/ed)

Economic		E Price Crop		47 L Berseem		W/Proj WO/Proj		Area 31500 Area 295500		% Share 15 % Share 15		CropArea 47370 CropArea 44325	
Item	Price/Unit	Qty WO/Proj	E Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	E Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4		
INCOME													
Main By Product	47/ton	25.00	1175.00	27.50	28.75	29.25	30.00	1292.50	1351.25	1374.75	1410.00		
PROD COST													
NonYield D:													
Seed	2.06/kg	25.00	51.50	25.00	25.00	25.00	25.00	51.50	51.50	51.50	51.50		
Manure	2.6/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fertilizer													
N	1.6/kg	15.00	24.00	15.00	15.00	15.00	15.00	24.00	24.00	24.00	24.00		
P2O5	1.5/kg	20.00	30.00	20.00	20.00	20.00	20.00	30.00	30.00	30.00	30.00		
K	1.3/kg	75.00	97.50	75.00	75.00	75.00	75.00	97.50	97.50	97.50	97.50		
Other													
Insectic'd	9.95/liter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95		
Fungic'd	30/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	2.50	25.00	2.50	2.50	2.50	2.50	25.00	25.00	25.00	25.00		
Spraying	5/hr	2.00	10.00	2.00	2.00	2.00	2.00	10.00	10.00	10.00	10.00		
Irrigat'n	10/hr	30.00	300.00	30.00	30.00	30.00	30.00	300.00	300.00	300.00	300.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	30.00	150.00	30.00	30.00	30.00	30.00	150.00	150.00	150.00	150.00		
Labor													
Family	1.2/hr	60.00	72.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Hired	1.2/hr	60.00	72.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnow'n	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	72.00	86.40	72.00	82.80	84.24	86.40	0.00	0.00	0.00	0.00		
Hired	1.2/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	LE/ed		928.35					841.95	841.95	841.95	841.95		
NET INCOME (LE/ed)			246.85					450.55	509.30	532.80	568.05		
OMOUM AREA NET INCOME (Mill LE)			10.93								28.91		
GROSS INCOME			52.08								66.79		
PRODUCTION COST			41.15								38.88		

Table I-2-40 Estimation of Net Income (S. Berseem)

Financial		E Price		61		W/Proj		Area		% Share		CropArea	
		Crop		S Berseem		WO/Proj		315800		25		78060	
								295500		25		73875	
Item	Price/Unit	Qty	F Value	Qty	With	Project	Yr1:Yr4	F Value	With	Project	Y1:Y4	Yr1	Yr4
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4	Yr1	Yr4
INCOME													
Main	61/ton	11.00	671.00	12.10	12.65	12.87	13.20	738.10	771.65	785.07	805.20		
By Product													
PROD COST													
NonYield D													
Seed	2.06/kg	25.00	51.50	25.00	25.00	25.00	25.00	51.50	51.50	51.50	51.50		
Mixture	2.8/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fertilizer													
N	1.1/kg	15.00	16.50	15.00	15.00	15.00	15.00	16.50	16.50	16.50	16.50		
P2O5	1.25/kg	20.00	25.00	20.00	20.00	20.00	20.00	25.00	25.00	25.00	25.00		
K	1.04/kg	75.00	78.00	75.00	75.00	75.00	75.00	78.00	78.00	78.00	78.00		
Other													
Insectic'd	9.95/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fungic'd	30/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Spraying	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Irrigat'n	10/hr	12.00	120.00	12.00	12.00	12.00	12.00	120.00	120.00	120.00	120.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	30.00	150.00	30.00	30.00	30.00	30.00	150.00	150.00	150.00	150.00		
Labor													
Family	1.2/hr	30.00	36.00	15.00	15.00	15.00	15.00	18.00	18.00	18.00	18.00		
Hired	1.2/hr	30.00	36.00	15.00	15.00	15.00	15.00	18.00	18.00	18.00	18.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnowin	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	36.00	43.20	39.60	41.40	42.12	43.20	47.52	49.68	50.54	51.84		
Hired	1.2/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	LE/ed		556.20					524.52	526.68	527.54	528.84		
NET INCOME(LE/ed)			114.80					213.58	244.97	257.53	276.36		
OMOUM AREA NET INCOME(MN LE)			8.48								21.82		
GROSS INCOME			49.57								63.57		
PRODUCTION COST			41.09								41.75		

Notes: Income=(Yield/ed)*(Price/unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/edden
 Cost of Production=(Quantity/ed)*(Price/unit)
 Net Income=Gross Income - Production Costs
 Omoum Net Income=Crop Share(%) Potential Development Area*(Net Income/ed)

Economic		E Price		47		W/Proj		Area		% Share		CropArea	
		Crop		S Berseem		WO/Proj		315800		25		78050	
								295500		25		73875	
Item	Price/Unit	Qty	E Value	Qty	With	Project	Yr1:Yr4	E Value	With	Project	Y1:Y4	Yr1	Yr4
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4	Yr1	Yr4
INCOME													
Main	47/ton	11.00	517.00	12.10	12.65	12.87	13.20	568.70	594.55	604.89	620.40		
By Product													
PROD COST													
NonYield D													
Seed	2.06/kg	25.00	51.50	25.00	25.00	25.00	25.00	51.50	51.50	51.50	51.50		
Mixture	2.8/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fertilizer													
N	1.8/kg	15.00	24.00	15.00	15.00	15.00	15.00	24.00	24.00	24.00	24.00		
P2O5	1.5/kg	20.00	30.00	20.00	20.00	20.00	20.00	30.00	30.00	30.00	30.00		
K	1.3/kg	75.00	97.50	75.00	75.00	75.00	75.00	97.50	97.50	97.50	97.50		
Other													
Insectic'd	9.95/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Fungic'd	30/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Spraying	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Irrigat'n	10/hr	12.00	120.00	12.00	12.00	12.00	12.00	120.00	120.00	120.00	120.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	30.00	150.00	30.00	30.00	30.00	30.00	150.00	150.00	150.00	150.00		
Labor													
Family	1.2/hr	30.00	36.00	15.00	15.00	15.00	15.00	18.00	18.00	18.00	18.00		
Hired	1.2/hr	30.00	36.00	15.00	15.00	15.00	15.00	18.00	18.00	18.00	18.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnowin	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	36.00	43.20	39.60	41.40	42.12	43.20	47.52	49.68	50.54	51.84		
Hired	1.2/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	LE/ed		568.20					558.62	558.88	559.64	560.84		
NET INCOME(LE/ed)			-71.20					12.18	35.87	45.35	59.58		
OMOUM AREA NET INCOME(MN LE)			-5.28								4.70		
GROSS INCOME			36.19								46.98		
PRODUCTION COST			43.45								44.28		

Table I-2-41 Estimation of Net Income (Vegetable (W))

Financial	Price/Unit	Qty WO/Proj	F Price	520		Project Yr3	Yr1:Yr4 Yr4	F Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4	
			Crop WO/Proj	Qty Yr1	With Yr2							Project Yr3
INCOME												
Main	520/ton		8.00	4160.00	9.20	9.60	10.00	10.00	4784.00	4992.00	5200.00	5200.00
By Product												
PROD COST												
NonYield D:												
Seed	7/kg		1.00	7.00	1.00	1.00	1.00	1.00	7.00	7.00	7.00	7.00
Manure	2.6/m3		30.00	78.00	30.00	30.00	30.00	30.00	78.00	78.00	78.00	78.00
Fertilizer												
N	1.1/kg		40.00	44.00	40.00	40.00	40.00	44.00	44.00	44.00	44.00	44.00
P2O5	1.25/kg		25.00	31.25	25.00	25.00	25.00	31.25	31.25	31.25	31.25	31.25
K	1.04/kg		80.00	83.20	80.00	80.00	80.00	83.20	83.20	83.20	83.20	83.20
Other												
Insect'd	9.95/liter		1.50	14.93	1.50	1.50	1.50	14.93	14.93	14.93	14.93	14.93
Fungic'd	30/liter		2.00	60.00	2.00	2.00	2.00	60.00	60.00	60.00	60.00	60.00
Herbic'd	15/liter		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machinery												
Land Prep	10/hr		3.50	35.00	3.50	3.50	3.50	35.00	35.00	35.00	35.00	35.00
Spraying	5/hr		8.00	40.00	8.00	8.00	8.00	40.00	40.00	40.00	40.00	40.00
Irrigat'n	10/hr		27.00	270.00	27.00	27.00	27.00	270.00	270.00	270.00	270.00	270.00
Animal												
Cultivat'n	10/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transp'n	5/hr		75.00	375.00	75.00	75.00	75.00	375.00	375.00	375.00	375.00	375.00
Labor												
Family	1.2/hr		148.00	177.60	148.00	148.00	148.00	177.60	177.60	177.60	177.60	177.60
Hired	1.2/hr		148.00	177.60	148.00	148.00	148.00	177.60	177.60	177.60	177.60	177.60
Yield Dep'd												
Machinery												
Threshing	25/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winnow'n	25/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Animal												
Transp'n	5/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labor												
Family	1.2/hr		72.50	87.00	83.30	87.00	90.63	90.63	90.63	104.40	108.78	108.78
Hired	1.2/hr		72.50	87.00	72.50	87.00	90.63	90.63	90.63	104.40	108.78	108.78
TOTAL	LE/ed			1567.58				1574.84	1602.38	1611.09	1611.09	
NET INCOME(LE/ed)				2592.43				3209.17	3389.63	3588.91	3588.91	
OMOU AREA NET INCOME(M/IL LE)				61.28							158.87	
GROSS INCOME				98.34							229.90	
PRODUCTION COST				37.08							71.23	

Notes: Income=(Yield/ed)*(Price/Unit)
Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
Crop Production Model, Input-Output in Physical quantity/ed/ha
Cost of Production=(Quantity/ed)*(Price/Unit)
Net Income=Gross Income - Production Costs
Omou Net Income=Crop Share(%)*Potential Development Area*(Net Income/ed)

Economic	Price/Unit	Qty WO/Proj	E Price	400		Project Yr3	Yr1:Yr4 Yr4	F Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4	
			Crop WO/Proj	Qty Yr1	With Yr2							Project Yr3
INCOME												
Main	400/ton		8.00	3200.00	9.20	9.60	10.00	10.00	3680.00	3840.00	4000.00	4000.00
By Product												
PROD COST												
NonYield D:												
Seed	7/kg		1.00	7.00	1.00	1.00	1.00	1.00	7.00	7.00	7.00	7.00
Manure	2.6/m3		30.00	78.00	30.00	30.00	30.00	30.00	78.00	78.00	78.00	78.00
Fertilizer												
N	1.6/kg		40.00	64.00	40.00	40.00	40.00	64.00	64.00	64.00	64.00	64.00
P2O5	1.5/kg		25.00	37.50	25.00	25.00	25.00	37.50	37.50	37.50	37.50	37.50
K	1.3/kg		80.00	104.00	80.00	80.00	80.00	104.00	104.00	104.00	104.00	104.00
Other												
Insect'd	9.95/liter		1.50	14.93	1.50	1.50	1.50	14.93	14.93	14.93	14.93	14.93
Fungic'd	30/liter		2.00	60.00	2.00	2.00	2.00	60.00	60.00	60.00	60.00	60.00
Herbic'd	15/liter		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machinery												
Land Prep	10/hr		3.50	35.00	3.50	3.50	3.50	35.00	35.00	35.00	35.00	35.00
Spraying	5/hr		8.00	40.00	8.00	8.00	8.00	40.00	40.00	40.00	40.00	40.00
Irrigat'n	10/hr		27.00	270.00	27.00	27.00	27.00	270.00	270.00	270.00	270.00	270.00
Animal												
Cultivat'n	10/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transp'n	5/hr		75.00	375.00	75.00	75.00	75.00	375.00	375.00	375.00	375.00	375.00
Labor												
Family	1.2/hr		148.00	177.60	148.00	148.00	148.00	177.60	177.60	177.60	177.60	177.60
Hired	1.2/hr		148.00	177.60	146.00	148.00	148.00	177.60	177.60	177.60	177.60	177.60
Yield Dep'd												
Machinery												
Threshing	25/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winnow'n	25/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Animal												
Transp'n	5/hr		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labor												
Family	1.2/hr		72.50	87.00	83.30	87.00	90.63	90.63	90.63	104.40	108.78	108.78
Hired	1.2/hr		72.50	87.00	72.50	87.00	90.63	90.63	90.63	104.40	108.78	108.78
TOTAL	LE/ed			1614.63				1621.89	1649.43	1658.14	1658.14	
NET INCOME(LE/ed)				1583.38				2058.12	2190.58	2341.86	2341.86	
OMOU AREA NET INCOME(M/IL LE)				37.48							103.54	
GROSS INCOME				75.65							176.85	
PRODUCTION COST				38.17							73.31	

Table 1-2-43 Estimation of Net Income (Maize)

Financial		F Price Crop 528 Maize			W/Proj Area 315800 % Share 28 CropArea 88424		WO/Proj Area 295500 % Share 28 CropArea 82740					
Item	Price/Unit	Qty WO/Proj	F Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	F Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4	
INCOME												
Main	528/ton	2.14	1130.98	2.29	2.36	2.44	2.46	1210.07	1244.07	1289.16	1300.99	
By Product	5/load	10.70	53.50	11.45	11.77	12.20	12.31	57.25	58.85	61.00	61.55	
Fodders	5/load	1.00	5.00	1.07	1.10	1.14	1.15	5.35	5.50	5.70	5.75	
PROD COST												
NonYield D												
Seed	7.71/kg	25.00	17.75	25.00	25.00	25.00	25.00	17.75	17.75	17.75	17.75	
Manure	2.6/m3	20.00	52.00	20.00	20.00	20.00	20.00	52.00	52.00	52.00	52.00	
Fertilizer												
N	1.1/kg	80.00	88.00	80.00	80.00	80.00	80.00	88.00	88.00	88.00	88.00	
P2O5	1.25/kg	70.00	87.50	70.00	70.00	70.00	70.00	87.50	87.50	87.50	87.50	
K	1.04/kg	60.00	62.40	60.00	60.00	60.00	60.00	62.40	62.40	62.40	62.40	
Other												
Insectic'd	9.95/liter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95	
Fungic'd	30/liter	1.50	45.00	1.50	1.50	1.50	1.50	45.00	45.00	45.00	45.00	
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Machinery												
Land Prep	10/hr	3.00	30.00	3.00	3.00	3.00	3.00	30.00	30.00	30.00	30.00	
Spraying	5/hr	4.00	20.00	4.00	4.00	4.00	4.00	20.00	20.00	20.00	20.00	
Irrigat'n	10/hr	27.00	270.00	27.00	27.00	27.00	27.00	270.00	270.00	270.00	270.00	
Animal												
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transp'n	5/hr	60.00	300.00	60.00	60.00	60.00	60.00	300.00	300.00	300.00	300.00	
Labor												
Family	1.2/hr	85.00	102.00	85.00	85.00	85.00	85.00	102.00	102.00	102.00	102.00	
Hired	1.2/hr	85.00	102.00	85.00	85.00	85.00	85.00	102.00	102.00	102.00	102.00	
Yield Dep'd												
Machinery												
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Winnow'n	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Animal												
Transp'n	5/hr	24.00	120.00	24.00	24.00	24.00	24.00	120.00	120.00	120.00	120.00	
Labor												
Family	1.2/hr	44.50	53.40	44.50	44.50	44.50	44.50	53.40	53.40	53.40	53.40	
Hired	1.2/hr	44.50	53.40	44.50	44.50	44.50	44.50	53.40	53.40	53.40	53.40	
TOTAL	LE/fed		1413.40					1413.40	1413.40	1413.40	1413.40	
NET INCOME (LE/fed)			-228.92					-146.09	-110.48	-63.24	-50.88	
OMOUM AREA NET INCOME (MR LE)			-18.94								-4.50	
GROSS INCOME			98.00								120.48	
PRODUCTION COST			118.94								124.98	

Notes: Income=(Yield/fed)*(Price/unit)
Yield WO/Proj & Yield W/Proj taken from Tables (1) through (10)
Crop Production Model, Input-Output in Physical quantity/fedden
Cost of Production=(Quantity/fed)*(Price/unit)
Net Income=Gross Income - Production Costs
Omoum Net Income=Crop Share(%)*Potential Development Area*(Net Income/fed)

Economic		E Price Crop 558 Maize			W/Proj Area 315800 % Share 28 CropArea 88424		WO/Proj Area 295500 % Share 28 CropArea 82740					
Item	Price/Unit	Qty WO/Proj	E Value WO/Proj	Qty Yr1	With Yr2	Project Yr3	Yr1:Yr4 Yr4	E Value Yr1	With Yr2	Project Yr3	Y1:Yr4 Yr4	
INCOME												
Main	558/ton	2.14	1190.95	2.29	2.36	2.44	2.46	1274.24	1310.06	1357.53	1369.98	
By Product	5/load	10.70	53.50	11.45	11.77	12.20	12.31	57.25	58.85	61.00	61.55	
Fodders	5/load	1.00	5.00	1.07	1.10	1.14	1.15	5.35	5.50	5.70	5.75	
PROD COST												
NonYield D												
Seed	9.93/kg	25.00	23.25	25.00	25.00	25.00	25.00	23.25	23.25	23.25	23.25	
Manure	2.6/m3	20.00	52.00	20.00	20.00	20.00	20.00	52.00	52.00	52.00	52.00	
Fertilizer												
N	1.6/kg	80.00	128.00	80.00	80.00	80.00	80.00	128.00	128.00	128.00	128.00	
P2O5	1.5/kg	70.00	105.00	70.00	70.00	70.00	70.00	105.00	105.00	105.00	105.00	
K	1.3/kg	60.00	78.00	60.00	60.00	60.00	60.00	78.00	78.00	78.00	78.00	
Other												
Insectic'd	9.95/liter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95	
Fungic'd	30/liter	1.50	45.00	1.50	1.50	1.50	1.50	45.00	45.00	45.00	45.00	
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Machinery												
Land Prep	10/hr	3.00	30.00	3.00	3.00	3.00	3.00	30.00	30.00	30.00	30.00	
Spraying	5/hr	4.00	20.00	4.00	4.00	4.00	4.00	20.00	20.00	20.00	20.00	
Irrigat'n	10/hr	27.00	270.00	27.00	27.00	27.00	27.00	270.00	270.00	270.00	270.00	
Animal												
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transp'n	5/hr	60.00	300.00	60.00	60.00	60.00	60.00	300.00	300.00	300.00	300.00	
Labor												
Family	1.2/hr	85.00	102.00	85.00	85.00	85.00	85.00	102.00	102.00	102.00	102.00	
Hired	1.2/hr	85.00	102.00	85.00	85.00	85.00	85.00	102.00	102.00	102.00	102.00	
Yield Dep'd												
Machinery												
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Winnow'n	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Animal												
Transp'n	5/hr	24.00	120.00	24.00	24.00	24.00	24.00	120.00	120.00	120.00	120.00	
Labor												
Family	1.2/hr	44.50	53.40	44.50	44.50	44.50	44.50	53.40	53.40	53.40	53.40	
Hired	1.2/hr	44.50	53.40	44.50	44.50	44.50	44.50	53.40	53.40	53.40	53.40	
TOTAL	LE/fed		1492.00					1492.00	1492.00	1492.00	1492.00	
NET INCOME (LE/fed)			-247.55					-160.51	-123.10	-73.47	-60.47	
OMOUM AREA NET INCOME (MR LE)			-20.48								-5.35	
GROSS INCOME			102.97								126.98	
PRODUCTION COST			123.45								131.83	

Table I-2-44 Estimation of Net Income (Rice)

Financial	Price/Unit	Qty	F Price		350		W/Proj		Area		Crop Area	
			Crop	RICE	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4
INCOME												
Main	350/ton	2.60	910.00	2.65	2.68	2.70	2.73	927.50	938.00	945.00	955.50	
By Product	5/soed	8.00	40.00	8.16	8.24	8.32	8.40	40.80	41.20	41.60	42.00	
Fodders												
PROD COST												
NonYield D												
Seed	1.5/kg	65.00	46.15	65.00	65.00	65.00	65.00	97.50	97.50	97.50	97.50	
Manure	2.6/m3	5.00	13.00	5.00	5.00	5.00	5.00	13.00	13.00	13.00	13.00	
Fertilizer												
N	1.1/kg	50.00	55.00	50.00	50.00	50.00	50.00	55.00	55.00	55.00	55.00	
P2O5	1.25/kg	15.00	18.75	15.00	15.00	15.00	15.00	18.75	18.75	18.75	18.75	
K	1.04/kg	30.00	31.20	30.00	30.00	30.00	30.00	31.20	31.20	31.20	31.20	
Other												
Insect/d	9.95/iter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95	
Fung/d	30/iter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herb/d	15/iter	2.00	30.00	2.00	2.00	2.00	2.00	30.00	30.00	30.00	30.00	
Machinery												
Land Prep	10/hr	2.00	20.00	2.00	2.00	2.00	2.00	20.00	20.00	20.00	20.00	
Spraying	5/hr	6.00	30.00	6.00	6.00	6.00	6.00	30.00	30.00	30.00	30.00	
Irrigatn	10/hr	55.00	550.00	55.00	55.00	55.00	55.00	550.00	550.00	550.00	550.00	
Animal												
Cultivatn	10/hr	10.00	100.00	10.00	10.00	10.00	10.00	100.00	100.00	100.00	100.00	
Transp'n	5/hr	15.00	75.00	15.00	15.00	15.00	15.00	75.00	75.00	75.00	75.00	
Labor												
Family	1.2/hr	88.50	106.20	88.50	88.50	88.50	88.50	106.20	106.20	106.20	106.20	
Hired	1.2/hr	86.50	106.20	86.50	86.50	86.50	86.50	106.20	106.20	106.20	106.20	
Yield Dep'd												
Machinery												
Threshing	25/hr	2.00	50.00	2.04	2.06	2.08	2.10	51.00	51.50	52.00	52.50	
Winnowin	25/hr	2.00	50.00	2.04	2.06	2.08	2.10	51.00	51.50	52.00	52.50	
Animal												
Transp'n	5/hr	20.00	100.00	20.40	20.60	20.80	21.00	102.00	103.00	104.00	105.00	
Labor												
Family	1.2/hr	30.00	36.00	30.60	30.90	31.20	31.50	36.72	37.08	37.44	37.80	
Hired	1.2/hr	30.00	36.00	30.60	30.90	31.20	31.50	36.72	37.08	37.44	37.80	
TOTAL	LE/ed		1463.45					1520.24	1522.96	1525.68	1528.40	
NET INCOME (LE/ed)				-513.45				-551.94	-543.76	-539.08	-530.90	
OMCOM AREA NET INCOME (M/1 LE)				-30.34							-31.86	
GROSS INCOME				56.15							59.85	
PRODUCTION COST				88.49							91.71	

Notes: Income=(Yield/ed)*(Price/unit)
 Yield W/O Proj & Yield W/Proj taken from Tables (1) through (10)
 Crop Production Model, Input-Output in Physical quantity/eddan
 Cost of Production=(Quantity/ed)*(Price/unit)
 Net Income=Gross Income - Production Costs
 Omcom Net Income=Crop Share(%)*Potential Development Area*(Net Income/ed)

Economic	Price/Unit	Qty	E Price		836		W/Proj		Area		Crop Area	
			Crop	RICE	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4
INCOME												
Main	636/ton	2.60	1653.60	2.65	2.68	2.70	2.73	1685.40	1704.48	1717.20	1736.28	
By Product	5/soed	8.00	40.00	8.16	8.24	8.32	8.40	40.80	41.20	41.60	42.00	
Fodders												
PROD COST												
NonYield D												
Seed	1.09/kg	65.00	70.85	65.00	65.00	65.00	65.00	70.85	70.85	70.85	70.85	
Manure	2.6/m3	5.00	13.00	5.00	5.00	5.00	5.00	13.00	13.00	13.00	13.00	
Fertilizer												
N	1.6/kg	50.00	80.00	50.00	50.00	50.00	50.00	80.00	80.00	80.00	80.00	
P2O5	1.5/kg	15.00	22.50	15.00	15.00	15.00	15.00	22.50	22.50	22.50	22.50	
K	1.3/kg	30.00	39.00	30.00	30.00	30.00	30.00	39.00	39.00	39.00	39.00	
Other												
Insect/d	9.95/iter	1.00	9.95	1.00	1.00	1.00	1.00	9.95	9.95	9.95	9.95	
Fung/d	30/iter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herb/d	15/iter	2.00	30.00	2.00	2.00	2.00	2.00	30.00	30.00	30.00	30.00	
Machinery												
Land Prep	10/hr	2.00	20.00	2.00	2.00	2.00	2.00	20.00	20.00	20.00	20.00	
Spraying	5/hr	6.00	30.00	6.00	6.00	6.00	6.00	30.00	30.00	30.00	30.00	
Irrigatn	10/hr	55.00	550.00	55.00	55.00	55.00	55.00	550.00	550.00	550.00	550.00	
Animal												
Cultivatn	10/hr	10.00	100.00	10.00	10.00	10.00	10.00	100.00	100.00	100.00	100.00	
Transp'n	5/hr	15.00	75.00	15.00	15.00	15.00	15.00	75.00	75.00	75.00	75.00	
Labor												
Family	1.2/hr	88.50	106.20	88.50	88.50	88.50	88.50	106.20	106.20	106.20	106.20	
Hired	1.2/hr	86.50	106.20	86.50	86.50	86.50	86.50	106.20	106.20	106.20	106.20	
Yield Dep'd												
Machinery												
Threshing	25/hr	2.00	50.00	2.04	2.06	2.08	2.10	51.00	51.50	52.00	52.50	
Winnowin	25/hr	2.00	50.00	2.04	2.06	2.08	2.10	51.00	51.50	52.00	52.50	
Animal												
Transp'n	5/hr	20.00	100.00	20.40	20.60	20.80	21.00	102.00	103.00	104.00	105.00	
Labor												
Family	1.2/hr	30.00	36.00	30.60	30.90	31.20	31.50	36.72	37.08	37.44	37.80	
Hired	1.2/hr	30.00	36.00	30.60	30.90	31.20	31.50	36.72	37.08	37.44	37.80	
TOTAL	LE/ed		1524.70					1530.14	1532.86	1535.58	1538.30	
NET INCOME (LE/ed)				168.90							14.40	
OMCOM AREA NET INCOME (M/1 LE)				9.98							106.70	
GROSS INCOME				100.09							92.30	
PRODUCTION COST				90.11								

Table I-2-45 Estimation of Net Income (Vegetable(S))

Financial		F Price		176		W/Proj		Area		% Share		CropArea	
		Crop		Veg(S)		WO/Proj		295500		18		56844	
Item	Price/Unit	Qty	F Value	Qty	With	Project	Yr1:Yr4	F Value	With	Project	Y1:Yr4		
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4		
INCOME													
Main	176/ton	12.00	2112.00	13.80	14.40	15.00	15.00	2428.80	2534.40	2640.00	2640.00		
By Product													
Fodders													
PROD COST													
NonYield D													
Seed	7/kg	12.00	84.00	5.00	5.00	5.00	5.00	35.00	35.00	35.00	35.00		
Manure	2.6/m3	20.00	52.00	20.00	20.00	20.00	20.00	52.00	52.00	52.00	52.00		
Fertilizer													
N	1.1/kg	60.00	66.00	60.00	60.00	60.00	60.00	66.00	66.00	66.00	66.00		
P2O5	1.25/kg	45.00	56.25	45.00	45.00	45.00	45.00	56.25	56.25	56.25	56.25		
K	1.04/kg	80.00	83.20	80.00	80.00	80.00	80.00	83.20	83.20	83.20	83.20		
Other													
Insectic'd	9.95/liter	5.00	49.75	5.00	5.00	5.00	5.00	49.75	49.75	49.75	49.75		
Fungic'd	30/liter	10.00	300.00	10.00	10.00	10.00	10.00	300.00	300.00	300.00	300.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	3.50	35.00	3.50	3.50	3.50	3.50	35.00	35.00	35.00	35.00		
Spraying	5/hr	25.00	125.00	25.00	25.00	25.00	25.00	125.00	125.00	125.00	125.00		
Irrigat'n	10/hr	30.00	300.00	30.00	30.00	30.00	30.00	300.00	300.00	300.00	300.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	75.00	375.00	75.00	75.00	75.00	75.00	375.00	375.00	375.00	375.00		
Labor													
Family	1.2/hr	150.00	180.00	150.00	150.00	150.00	150.00	180.00	180.00	180.00	180.00		
Hired	1.2/hr	150.00	180.00	150.00	150.00	150.00	150.00	180.00	180.00	180.00	180.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnowin	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	7.14	35.70	8.21	8.67	8.93	8.93	41.05	42.85	44.65	44.65		
Labor													
Family	1.2/hr	72.50	87.00	83.38	87.00	90.63	90.63	100.06	104.40	108.76	108.76		
Hired	1.2/hr	72.50	87.00	83.38	87.00	90.63	90.63	100.06	104.40	108.76	108.76		
TOTAL	LE/fed		2095.90					2078.38	2088.85	2099.36	2099.36		
NET INCOME(LE/fed)													
OMOU AREA NET INCOME(Mil LE)													
GROSS INCOME													
PRODUCTION COST													

Notes: Income=(Yield/fed)*(Price/unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/feddan
 Cost of Production=(Quantity/fed)*(Price/unit)
 Net Income=Gross Income - Production Costs
 Oroum Net Income=Crop Share(%)*Potential Development Area*Net Income/fed

Economic		E Price		300		W/Proj		Area		% Share		CropArea	
		Crop		Veg(S)		WO/Proj		295500		18		56844	
Item	Price/Unit	Qty	E Value	Qty	With	Project	Yr1:Yr4	E Value	With	Project	Y1:Yr4		
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4		
INCOME													
Main	300/ton	12.00	3600.00	13.80	14.40	15.00	15.00	4140.00	4320.00	4500.00	4500.00		
By Product													
Fodders													
PROD COST													
NonYield D													
Seed	7/kg	12.00	84.00	5.00	5.00	5.00	5.00	35.00	35.00	35.00	35.00		
Manure	2.6/m3	20.00	52.00	20.00	20.00	20.00	20.00	52.00	52.00	52.00	52.00		
Fertilizer													
N	1.6/kg	60.00	96.00	60.00	60.00	60.00	60.00	96.00	96.00	96.00	96.00		
P2O5	1.5/kg	45.00	67.50	45.00	45.00	45.00	45.00	67.50	67.50	67.50	67.50		
K	1.3/kg	80.00	104.00	80.00	80.00	80.00	80.00	104.00	104.00	104.00	104.00		
Other													
Insectic'd	9.95/liter	5.00	49.75	5.00	5.00	5.00	5.00	49.75	49.75	49.75	49.75		
Fungic'd	30/liter	10.00	300.00	10.00	10.00	10.00	10.00	300.00	300.00	300.00	300.00		
Herbic'd	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	3.50	35.00	3.50	3.50	3.50	3.50	35.00	35.00	35.00	35.00		
Spraying	5/hr	25.00	125.00	25.00	25.00	25.00	25.00	125.00	125.00	125.00	125.00		
Irrigat'n	10/hr	30.00	300.00	30.00	30.00	30.00	30.00	300.00	300.00	300.00	300.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	75.00	375.00	75.00	75.00	75.00	75.00	375.00	375.00	375.00	375.00		
Labor													
Family	1.2/hr	150.00	180.00	150.00	150.00	150.00	150.00	180.00	180.00	180.00	180.00		
Hired	1.2/hr	150.00	180.00	150.00	150.00	150.00	150.00	180.00	180.00	180.00	180.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnowin	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	7.14	35.70	8.21	8.67	8.93	8.93	41.05	42.85	44.65	44.65		
Labor													
Family	1.2/hr	72.50	87.00	83.38	87.00	90.63	90.63	100.06	104.40	108.76	108.76		
Hired	1.2/hr	72.50	87.00	83.38	87.00	90.63	90.63	100.06	104.40	108.76	108.76		
TOTAL	LE/fed		2157.95					2140.41	2150.90	2161.41	2161.41		
NET INCOME(LE/fed)													
OMOU AREA NET INCOME(Mil LE)													
GROSS INCOME													
PRODUCTION COST													

Table I-2-46 Estimation of Net Income (Citrus)

Table I-2-46		F Price		548		W/Proj		Area		% Share		CropArea	
		Crop		Citrus		WO/Proj		315800		13		41054	
		285500		13				285500		13		38415	
Item	Price/Unit	Qty	F Value	Qty	With	Project	Yr1:Yr4	F Value	With	Project	Y1:Yr4		
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4		
INCOME													
Main	546/ton		6.20 3385.20		6.33	6.57	6.78	6.82	3456.18	3587.22	3690.96	3723.72	
By Product													
Fodders													
PROD COST													
NonYield D													
Seed	9.4/kg	25.00	235.00	25.00	25.00	25.00	25.00	235.00	235.00	235.00	235.00		
Manure	2.8/m3												
Fertilizer													
N	1.1/kg	80.00	88.00	150.00	150.00	150.00	150.00	165.00	165.00	165.00	165.00		
P2O5	1.25/kg	100.00	125.00	110.00	110.00	110.00	110.00	137.50	137.50	137.50	137.50		
K	1.04/kg	100.00	104.00	100.00	100.00	100.00	100.00	104.00	104.00	104.00	104.00		
Other													
Insect/d	9.95/liter	172.00	1711.40	172.00	172.00	172.00	172.00	1711.40	1711.40	1711.40	1711.40		
Fungic/d	30/liter	10.00	300.00	10.00	10.00	10.00	10.00	300.00	300.00	300.00	300.00		
Herbic/d	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	4.17	41.70	2.50	2.50	2.50	2.50	25.00	25.00	25.00	25.00		
Spraying	5/hr	2.00	10.00	2.00	2.00	2.00	2.00	10.00	10.00	10.00	10.00		
Irriga'n	10/hr	60.00	600.00	42.00	42.00	42.00	42.00	420.00	420.00	420.00	420.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	60.00	300.00	120.00	120.00	120.00	120.00	600.00	600.00	600.00	300.00		
Labor													
Family	1.2/hr	90.00	108.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Hired	1.2/hr	90.00	108.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnow'r	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	55.00	66.00	59.40	61.05	62.70	63.25	71.28	73.26	75.24	75.90		
Hired	1.2/hr	55.00	66.00	59.40	61.05	62.70	63.25	71.28	73.26	75.24	75.90		
Bagging	1.2/hr	5.83	7.00	6.30	6.47	6.65	6.70	7.58	7.78	7.98	8.04		
TOTAL	LE/led		3670.10					4002.02	4006.18	4010.36	3711.74		
NET INCOME(LE/led)			-484.90					-545.84	-418.96	-319.40	11.98		
OMCUM AREA NET IN/ME(MB/LE)			-16.63								0.49		
GROSS INCOME			130.04								152.87		
PRODUCTION COST			148.67								152.36		

Notes: Income=(Yield/led)*(Price/unit)
 Yield WO/Proj & Yield W/Proj taken from Tables(1) through (10)
 Crop Production Model, Input-Output in Physical quantity/led/dan
 Cost of Production=(Quantity/led)*(Price/unit)
 Net Income=Gross Income - Production Costs
 Omcum Net Income=Crop Share(%)*Potential Development Area*(Net Income/led)

Table I-2-46A		E Price		450		W/Proj		Area		% Share		CropArea	
		Crop		Citrus		WO/Proj		315800		13		41054	
		295500		13				295500		13		38415	
Item	Price/Unit	Qty	E Value	Qty	With	Project	Yr1:Yr4	F Value	With	Project	Y1:Yr4		
		WO/Proj	WO/Proj	Yr1	Yr2	Yr3	Yr4	Yr1	Yr2	Yr3	Yr4		
INCOME													
Main	450/ton		6.20 2790.00		6.70	6.88	7.07	7.13	3015.00	3096.00	3161.50	3206.50	
By Product													
Fodders													
PROD COST													
NonYield D													
Seed	10.5/kg	25.00	262.50	25.00	25.00	25.00	25.00	262.50	262.50	262.50	262.50		
Manure	2.8/m3												
Fertilizer													
N	1.6/kg	80.00	128.00	150.00	150.00	150.00	150.00	240.00	240.00	240.00	240.00		
P2O5	1.5/kg	100.00	150.00	110.00	110.00	110.00	110.00	165.00	165.00	165.00	165.00		
K	1.3/kg	100.00	130.00	100.00	100.00	100.00	100.00	130.00	130.00	130.00	130.00		
Other													
Insect/d	9.95/liter	172.00	1711.40	172.00	172.00	172.00	172.00	1711.40	1711.40	1711.40	1711.40		
Fungic/d	30/liter	10.00	300.00	10.00	10.00	10.00	10.00	300.00	300.00	300.00	300.00		
Herbic/d	15/liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Machinery													
Land Prep	10/hr	4.17	41.70	2.50	2.50	2.50	2.50	25.00	25.00	25.00	25.00		
Spraying	5/hr	2.00	10.00	2.00	2.00	2.00	2.00	10.00	10.00	10.00	10.00		
Irriga'n	10/hr	60.00	600.00	30.00	30.00	30.00	30.00	300.00	300.00	300.00	300.00		
Animal													
Cultivat'n	10/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Transp'n	5/hr	60.00	300.00	30.00	30.00	30.00	30.00	150.00	150.00	150.00	150.00		
Labor													
Family	1.2/hr	90.00	108.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Hired	1.2/hr	90.00	108.00	60.00	60.00	60.00	60.00	72.00	72.00	72.00	72.00		
Yield Dep'd													
Machinery													
Threshing	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Winnow'r	25/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Animal													
Transp'n	5/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Labor													
Family	1.2/hr	55.00	66.00	59.40	61.05	62.70	63.25	71.28	73.26	75.24	75.90		
Hired	1.2/hr	55.00	66.00	59.40	61.05	62.70	63.25	71.28	73.26	75.24	75.90		
Bagging	1.2/hr	5.83	7.00	6.30	6.47	6.65	6.70	7.58	7.78	7.98	8.04		
TOTAL	LE/led		3688.60					3588.02	3592.18	3596.36	3597.74		
NET INCOME(LE/led)			-1198.60					-573.02	-496.18	-414.66	-389.24		
OMCUM AREA NET IN/ME(MB/LE)			-48.04								-15.98		
GROSS INCOME			107.18								131.72		
PRODUCTION COST			153.22								147.70		

Table I-2-48 Net Incremental Crop Value by Area

Year	0.046 Abla		0.028 Hares		Tablet-2-34 Dhrudi		0.119 Trugs		0.286 Sheerstra		0.354 Abnon		0.158 Total		W-WO E Value M/LE	
	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE	W-VO F Value M/LE	W-WO E Value M/LE
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	1.19	1.38	0.75	1.87	20.76	36.48	3.69	8.54	4.27	7.70	6.86	7.94	3.06	3.54	41.31	47.67
7	2.38	2.76	1.50	3.12	31.26	36.48	7.38	15.40	17.82	13.72	15.88	6.12	7.78	77.76	90.30	132.84
8	3.57	4.14	2.25	4.42	44.42	52.21	11.07	23.10	26.73	20.58	23.82	9.18	10.62	114.17	145.98	170.36
9	4.76	5.52	3.00	6.21	52.21	62.74	14.76	30.90	35.64	27.44	31.76	12.24	14.16	145.98	189.67	219.90
10	5.95	6.98	3.75	8.25	62.74	82.74	18.44	46.18	53.47	41.16	47.64	16.36	21.24	188.74	242.89	283.38
11	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
12	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
13	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
14	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
15	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
16	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
17	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
18	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
19	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
20	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
21	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
22	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
23	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
24	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
25	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
26	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
27	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
28	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
29	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
30	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
31	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
32	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
33	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
34	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
35	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
36	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
37	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
38	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
39	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
40	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
41	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
42	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
43	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
44	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
45	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
46	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
47	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
48	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
49	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86
50	7.13	8.25	4.49	10.74	82.74	102.74	18.44	61.68	70.94	48.02	55.58	21.42	28.35	231.38	298.56	354.86

Assume: Partial Benefits Accrue Year 6 and Full Benefits Years 9 to 50 for Hares Area
 Partial Benefits Accrue Year 6, Full Benefits Year 13 and Thereafter for Other Areas Except Hares
 F(E) Value=(Yield/Fed)*Crop Area/F(E) Value/Rate of Increase in Yields
 Allocation Factor by Area is based on Crop % Share with project, last column,(Area-Hares,% adjShare),Tablet-2-51.

Table I-2-50 Estimates of Flood Damage by Crop, 1991

	Omoum		Area		F Price LE	Damaged Value Mill LE	Prob=0.1 Expected Dm'd Value Mill LE
	Area ha	Unit Yield ton/ha	Yield ton				
Wheat	3604	5.00	18020		639	11.51	1.15
L Bersh'm	694	59.52	41307		61	2.52	0.25
S Bersh'm	1181	26.19	30930		61	1.89	0.19
Beans	859	2.00	1718		1283	2.20	0.22
Veg(W)	1370	19.05	26099		520	13.57	1.36
Total	7708		118074			31.70	3.17

Estimates of Crop Damage Reduction by Area

Drainage Area	Cultivated Area ha	Damage Red Fac'r %	Crop Damage 1000 LE
Hares	22650	52.0	1648.40
Qalla	5000	6.9	218.73
Abis	3210	9.5	301.15
Dishudi	13030	8.1	256.77
Truga	32620	15.6	494.52
Shereshera	38760	1.2	38.04
Abu Homos	17360	6.7	212.39
Total	132630	100	3170.00

Damage Reduction Factor is computed from Table F-1-35

Table I-2-51 Allocation Factor of Crop Value by Area

Net Increase of F(E) Income = Area's Crop Share
adjusted by area excluding Hares

Area	WO/Proj No TD % Share	WO/Proj TD % Share	WO/Proj No TD+TD % Share	W/Proj No TD+TD by Area	W/Proj CropArea % Share	W/Proj area-Hares % adjShare
Qualla	0 0%	10860 100%	10860 100%	11900	3.8%	4.6%
Abis	0 0%	7650 100%	7650 100%	7650	2.4%	2.9%
Hares	500 1%	46690 99%	47190 100%	53920	17.1%	Excluded
Dishudi	0 0%	28633 100%	28633 100%	31030	9.8%	11.9%
Truga	14710 20%	60228 80%	74938 100%	77680	24.6%	29.8%
Shereshera	81550 96%	3572 4%	85122 100%	92290	29.2%	35.4%
AbuHomos	40884 99%	223 1%	41107 100%	41330	13.1%	15.8%
Total	137645.2	157860.8	295506	315800	100.0%	100.0%

Table 1-2-52 Total Project Costs for Study Area

(Unit: '000 LE)

Descriptions	Unit Cost	Priority Develop. Project		Abis Area		Qaila Area		Hairoz Area		Dishdi Area		Trafqa Area		Shertsaba Area		Abu Hornos Area		Total
		Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	
1. Construction Works																		
1.1 Preparatory Works		LS	477	-	-	-	-	LS	2,080	1,377	LS	2,538	-	-	-	-	-	6,472
1.2 Pumping Works		Q=87.6 m ³ /s L=10.0 km	52,033	-	-	-	-	Q=30.0 m ³ /s	32,821	5,000	Q=4.0 m ³ /s	5,000	-	-	-	-	-	94,854
1.3 Onoum Main Drain Works		L=10.0 km	43,802	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43,802
1.4 Discharge-Channel and Resettlement Works			18,282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,282
1.5 Drain Works	1,268.5 LE/ha		-	A=3,780 ha	4,794	A=5,880 ha	7,458	A=26,600 ha	33,741	A=15,330 ha	19,446	A=43,080 ha	54,646	A=56,720 ha	71,949	A=19,910 ha	25,256	217,290
1.6 Road Works	788.2 LE/ha		-	A=3,780 ha	2,979	A=5,880 ha	4,634	A=26,600 ha	20,966	A=15,330 ha	12,083	A=43,080 ha	33,955	A=56,720 ha	44,706	A=19,910 ha	15,693	135,016
1.7 Soil Impregnation Works	1,142.3 LE/ha		-	A=3,210 ha	3,667	A=5,000 ha	5,712	A=22,650 ha	25,872	A=13,030 ha	14,884	A=32,620 ha	37,262	-	-	-	-	87,397
1.8 Monitoring Set	LS	2 Place	346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	346
Sub-total			111,160		11,440		17,804		115,490		52,790		133,401		116,655		40,949	603,459
2. On-Farm Development and Subsurface Drain Works	1,786 LE/ha		-	A=3,210 ha	5,733	A=5,000 ha	8,930	A=22,650 ha	40,453	A=13,030 ha	23,272	26,440	47,222	A=4,510	8,055	-	-	133,665
3. Land Acquisition and Compensation Works			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	636
4. Engineering and Administration Works																		
4.1 Consulting Services	682.4 LE/ha	LS	16,546	A=3,780 ha	2,579	A=5,880 ha	4,013	A=26,600 ha	18,152	A=15,330 ha	10,461	A=43,080 ha	29,398	-	-	-	-	81,149
4.2 Administration	106.7 LE/ha	LS	2,837	A=3,780 ha	403	A=5,380 ha	627	A=26,600 ha	2,837	A=15,330 ha	1,636	A=43,080 ha	4,597	A=56,720 ha	6,052	A=19,910 ha	2,134	21,113
Sub-total			19,383		2,982		4,640		20,989		12,097		33,995		6,052		2,124	102,262
5. O&M Equipment	229.9 LE/ha	LS	3,680	A=3,780 ha	869	A=5,880 ha	1,352	A=26,600 ha	6,115	A=15,330 ha	3,524	A=43,080 ha	9,904	A=56,720 ha	13,040	A=19,910 ha	4,577	43,061
6. Total (1-5)			138,003		21,024		32,726		183,673		91,683		224,522		143,802		47,650	883,083
7. Physical Contingency (10%)			13,800		2,103		3,273		18,367		9,166		22,452		14,380		4,765	88,308
8. Total (6-7)			151,803		23,127		35,999		202,040		100,851		246,974		158,182		52,415	971,391

Table 1 - 2 - 53 Disbursement Schedule of Project Costs for Study Area

(Unit: '000 LE)

Descriptions	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
	1. Construction Works									
1.1 Preparatory Works	2,557	-	1,377	2,538	-	1,667	5,000	3,333	-	6,472
1.2 Pumping Works	-	-	-	28,269	56,585	-	-	-	-	94,854
1.3 Omoum Main Drain Works	-	-	14,601	14,601	14,601	-	-	-	-	43,802
1.4 Discharge-Channel and Resettlement Works	-	-	12,189	6,093	-	-	-	-	-	18,282
1.5 Drain Works	-	-	16,870	20,600	15,849	39,443	75,926	48,602	-	217,290
1.6 Road Works	-	-	13,977	10,980	11,589	27,664	51,593	20,113	-	135,016
1.7 Soil Improvement Works	-	-	8,622	10,529	11,750	20,508	18,604	17,384	-	87,397
1.8 Monitoring Set	-	-	346	-	-	-	-	-	-	346
Sub-total	2,557	-	67,981	92,710	110,374	89,282	151,123	89,432	-	603,459
2. On-Farm Development and Subsurface Drain Works	-	-	13,484	16,461	26,130	28,384	28,094	18,427	2,685	133,665
3. Land Acquisition and Compensation Works	-	318	-	-	-	-	-	-	-	636
4. Engineering and Administration Works										
4.1 Consulting Services	10,193	2,116	10,740	17,889	13,090	9,709	10,044	7,368	-	81,149
4.2 Administration	288	1,375	1,597	2,211	3,479	3,660	3,515	3,042	1,946	21,113
Sub-total	10,481	3,491	12,337	20,100	16,569	13,369	13,559	10,410	1,946	102,262
5. O&M Equipment	9,795	1,352	4,393	9,904	17,617	-	-	-	-	43,061
6. Total (1-5)	22,833	5,161	98,513	139,175	170,690	131,035	192,776	118,269	4,631	883,083
7. Physical Contingency (10%)	2,283	516	9,851	13,918	17,069	13,104	19,278	11,827	463	88,308
8. Total (6-7)	25,116	5,677	108,364	153,093	187,759	144,139	212,054	130,096	5,094	971,391
9. Price Escalation	703	556	21,348	50,980	95,563	105,510	215,235	178,362	9,322	677,579
10. Grand Total	25,819	6,233	129,712	204,073	283,322	249,649	427,289	308,458	14,416	1,648,970

Note: Above annual disbursement costs are estimated based on the following implementation schedule.

Drainage Block	Drainage Area		Implementation Period								
	ha	feddan	1998	1999	2000	2001	2002	2003	2004	2005	2006
Priority Dev. Project	9,410	(22,440)									
Qalla Area	5,880	(14,000)									
Abis Area	3,780	(9,000)									
Hares Area	26,600	(63,330)									
Dishudi Area	15,330	(36,500)									
Truga Area	43,080	(102,570)									
Sherahera Area	56,720	(135,060)									
Abu Hommos Area	19,910	(47,400)									
Total	180,710	(430,260)									

Table I-2-54

Irrigation System Improvement Costs for Study Area

(unit : '000 LE)

Year	Project Cost 1/			Economic Cost 2/		
	F/C	L/C	Total	F/C	L/C	Total
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	10,739	5,782	16,521	9,343	5,782	15,125
2001	10,739	5,783	16,522	9,343	5,783	15,126
2002	10,739	5,783	16,522	9,343	5,783	15,126
2003	10,739	5,783	16522	9,343	5,783	15,126
2004	10,739	5,783	16522	9,343	5,783	15,126
2005	10,739	5,783	16522	9,343	5,783	15,126
2006	10,739	5,783	16522	9,343	5,783	15,126
Total	75,173	40,480	115,653	65,401	40,480	105,881

Note: 1/ : Total project costs are estimated making reference to West Nubariya Agricultural Intensification Project, as shown below:
 872 LE/ha (366 LE/fed.) x 132,630 ha = 115,653,000 LE
 Foreign and local portions are estimated on the basis of 65 and 36 percent of total cost.

2/ : Economic costs = Project cost x 0.87

Table I-2-55 Estimation of Economic Project Costs for Study Area

Year	Priority Development Project Cost 1/		Total Allocation Cost 3/		Allocated Costs for Agric. Sector 4/		Allocated Priority Development Costs for Agricultural Sector		Economic Priority Development Costs for Agric. Sectors 5/		
	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	
1998	15.983	6.850	0	0	0	0	0	17.581	7.535	15.295	6.555
1999	3.613	1.548	0	0	0	0	0	3.974	1.703	3.457	1.482
2000	68.959	29.554	8.532	3.657	5.972	2.560	8.532	73.039	31.303	63.544	27.234
2001	97.423	41.752	24.063	10.309	16.837	7.216	24.053	99.228	42.525	86.328	36.937
2002	119.483	51.207	39.610	16.975	27.727	11.883	39.610	118.360	50.727	102.973	44.132
2003	91.725	39.310	1.167	500	817	350	1.167	100.513	43.076	87.446	37.476
2004	134.943	57.833	3.500	1.500	2.450	1.050	3.500	147.282	63.121	128.135	54.915
2005	82.788	35.481	2.333	1.000	1.633	700	2.333	90.297	38.699	78.558	33.668
2006	3.242	1.389	0	0	0	0	0	3.566	1.528	3.102	1.329
Total	618.159	284.924	883.083	33.941	113.136	55.436	79.195	653.840	280.217	568.838	243.788

Note: 1/ : Foreign and local costs are divided with a ration of 70 and 30 percent of total costs.
 2/ : Project costs mentioned in the above do not include the contingency and price escalation cost (see Table I-2-53)
 3/ : Project costs exclusive of contingency.
 4/ : Allocating share for Agricultural sector = Total allocation costs x sharing ratio 0.7
 Hares and Abis pumping station discharge = 444 MCM
 Omoumu main drain discharge = 843 MCM
 Other discharge = 542 MCM
 Total = 1.829 MCM

Sharing ratio = (444 + 843)/1.829 = 0.70
 5/ : Economic project costs = Project costs for foreign currency portions x Standard Conversion Factor (SCF) of 0.87

Table I-2-56 Operation and Maintenance Cost for Study Area

(unit: '000LE)

Drainage Block	Drainage Area (ha) (1)	O & M Cost (' 000 LE) 1/ (2)	Allocation of		Total O&M Cost (' 000 LE) (4) = (2) + (3)	Total Economic O & M Cost 5/ (' 000 LE) (5)
			O&M Cost of Pri. Dev. Project (' 000 LE) (3)	Project		
Priority Dev. Project	9,410	1,833 2/				
Qalla Area	5,880	413	44 4/		457	420
Abis Area	3,780	266	28		294	270
Hares Area	26,600	1,869 3/	203		2,072	1,906
Dishudi Area	15,330	1,078	115		1,193	1,098
Truga Area	43,080	3,029	323		3,352	3,084
Shereshera Area	56,720	3,987	425		4,412	4,059
Abu Hommos Area	19,910	1,400	149		1,549	1,425
Total	180,710	13,875	1,287		13,329	12,262

Note : 1/: O & M costs for each block except Hares Area are estimated applying unit O & M cost of 70.3 LE/ha, which was estimated based on Hares Area O & M costs.
 $1,869,100 \text{ LE} / 26,600 \text{ ha} = 70.3 \text{ LE/ha}$

Note: 2/: see Table H-2-22

3/: see Table H-2-11

4/: Allocation of O&M cost = $1,833,000 \text{ LE} \times 5,880 \text{ ha} / (180,710 - 9,410) \times 0.7$

5/: Economic O & M cost = Total O & M cost $\times 0.92$ (in case of Hares area)

Table I-2-57 Replacement Costs for Study Area

Description	Drainage Area		Discharge (cu.m/s) (2)	Replacement Cost 1/ (' 000 LE) (3)		Allocated Replacement Cost Agric. Sector (' 000 LE) (4)		Economic Replacement Cost Agric. Sector (' 000 LE) (6)		Each Block (' 000 LE) (7)
	(ha) (1)									
Priority Dev. Project	9.410									
El-Max pump (new)			87.5	40,700	28,490 2/	24,786 4/ (2022) 5/				
El-Max pump (No. 2)			62.5	29,071	20,350	17,705 (2008,2033)				
Gate			-	3,276	2,293	1,995 (2022)				
Sub-Total				73,047						
Qaila pump	5.880		10.0	8,500	8,500	7,395 (2015,2040)				8,922
Abis pump	3.780		5.4	4,590	4,590	3,993 (2015,2040)				4,975
Hares pump	26.600		30.0	25,500	25,500	22,185 (2022)				29,093
Dishudi pump	15.330									
Dishudi pump (old)			16.0	13,600	13,600	11,832 (2014,2039)				15,017
Dishudi pump (new)			4.0	3,400	3,400	2,958 (2022)				3,754
Truga Pump	43.080									
Truga pump (old)			36.0	30,600	30,600	26,622 (2014,2039)				36,691
Truga pump (new)			4.0	3,400	3,400	2,958 (2022)				4,077
Shereshera Pump	56.720		40.0	34,000	34,000	29,580 (2002,2027)				44,310
Abu Homos Pump	19.910		25.0	21,250	21,250	18,488 (2015,2040)				23,658
Total	171.300			217,887	195,973	170,497				170,497

Note: 1/: Replacement cost of El-Max pump (No.2) is estimated applying 465 E/cu.m/sec in case of that of El-Max pump (new).
On the other hand, replacement cost of pumps for each block is estimated applying unit replacement cost of 850 LE/cu.m/sec in case of Hares Pumping station.

2/: Allocated replacement cost = Replacement costs of priority development project x 0.70
3/: Replacement costs of each block = Replacement cost of each block (5) + Allocated replacement costs of priority development project for agricultural sector.

4/: Economic replacement costs = Financial replacement costs x 0.87

5/: Figures in parenthesis show the replacement year of the equipment.

Table I-2-58 Internal Rate of Return for Omoum Area

Net Benefits Accrue 6th to 9th Yr	Assumed Area		at 6th Yr	and	Full	Benefits	at 9th Yr	and	thereafter	EIRR
	Diff W - WO F Value	Diff W - WO E Value	ProjCost		O&M	Irr'n&Gate Repl Cost	Pump Repl Cost	Flood Reduct'n Benefits	FIRR 0.1455	
	MILL E	MILL E	MILL E		MILL E	MILL E	MILL E	MILL E	MILL E	MILL E
1	0.00	0.00	21.85		12.23			3.17	-30.91	-30.91
2	0.00	0.00	4.94		12.23			3.17	-14.00	-14.00
3	0.00	0.00	90.78		12.23	15.12		3.17	-114.96	-114.96
4	0.00	0.00	123.33		12.23	15.12		3.17	-147.51	-147.51
5	0.00	0.00	147.11		12.23	15.12	29.59	3.17	-200.88	-200.88
6	41.31	47.67	124.92		12.23	15.12		3.17	-107.79	-101.43
7	77.76	90.30	183.05		12.23	15.12		3.17	-129.47	-116.93
8	114.17	132.94	112.23		12.23	15.12		3.17	-22.24	-3.47
9	145.98	170.38	4.43		12.23	15.12		3.17	117.37	141.77
10	169.22	198.67			12.23			3.17	160.16	189.61
11	188.74	219.90			12.23	2.21	17.71	3.17	159.76	190.92
12	198.66	231.38			12.23			3.17	189.60	222.32
13	208.56	242.89			12.23			3.17	199.50	233.83
14	208.56	242.89			12.23			3.17	199.50	233.83
15	208.56	242.89			12.23			3.17	199.50	233.83
16	208.56	242.89			12.23			3.17	199.50	233.83
17	208.56	242.89			12.23		38.45	3.17	161.05	195.38
18	208.56	242.89			12.23		29.88	3.17	169.62	203.95
19	208.56	242.89			12.23			3.17	199.50	233.83
20	208.56	242.89			12.23			3.17	199.50	233.83
21	208.56	242.89			12.23			3.17	199.50	233.83
22	208.56	242.89			12.23			3.17	199.50	233.83
23	208.56	242.89			12.23			3.17	199.50	233.83
24	208.56	242.89			12.23			3.17	199.50	233.83
25	208.56	242.89			12.23	7.52	54.88	3.17	137.10	171.43
26	208.56	242.89			12.23			3.17	199.50	233.83
27	208.56	242.89			12.23			3.17	199.50	233.83
28	208.56	242.89			12.23			3.17	199.50	233.83
29	208.56	242.89			12.23			3.17	199.50	233.83
30	208.56	242.89			12.23			3.17	199.50	233.83
31	208.56	242.89			12.23			3.17	199.50	233.83
32	208.56	242.89			12.23			3.17	199.50	233.83
33	208.56	242.89			12.23			3.17	199.50	233.83
34	208.56	242.89			12.23			3.17	199.50	233.83
35	208.56	242.89			12.23			3.17	199.50	233.83
36	208.56	242.89			12.23		17.71	3.17	181.79	216.12
37	208.56	242.89			12.23			3.17	199.50	233.83
38	208.56	242.89			12.23			3.17	199.50	233.83
39	208.56	242.89			12.23			3.17	199.50	233.83
40	208.56	242.89			12.23			3.17	199.50	233.83
41	208.56	242.89			12.23			3.17	199.50	233.83
42	208.56	242.89			12.23		38.45	3.17	161.05	195.38
43	208.56	242.89			12.23		29.88	3.17	169.62	203.95
44	208.56	242.89			12.23			3.17	199.50	233.83
45	208.56	242.89			12.23			3.17	199.50	233.83
46	208.56	242.89			12.23			3.17	199.50	233.83
47	208.56	242.89			12.23			3.17	199.50	233.83
48	208.56	242.89			12.23			3.17	199.50	233.83
49	208.56	242.89			12.23			3.17	199.50	233.83
50	208.56	242.89			12.23			3.17	199.50	233.83

Columns (1) and (2) were taken from last two columns of F & E value of Table I-2-48, Area Total F Value(W-WO), and Area Total E Value(W-WO).

Table I-2-60 Farm Budget Production Model for Omoum Area

Table I-2-35 thru I-2-44

Crop	Without Crop Fed	NetIncome LE/Fed	Project F Value LE	With Crop Fed	NetIncome LE/Fed	Project F Value LE	Diff F Value LE
Wheat	1.18	168	198	1.18	360	423	226
Bean	0.21	300	63	0.21	333	70	7
L Bersh'm	0.63	629	396	0.63	1020	643	247
S Bersh'm	1.05	115	121	1.05	276	290	170
Cotton	0.92	1440	1330	0.92	2125	1964	634
Sunflower	0.04	-273	-11	0.04	-167	-7	4
Maize	1.18	-229	-269	1.18	-40	-47	222
Veg(W)	0.34	2592	871	0.59	3649	2146	1275
Veg(S)	0.46	16	7	0.76	541	409	401
Citrus	0.55	-311	-170	0.55	2664	1455	1624
Rice	0.84	-513	-431	0.80	-530	-423	8
Total	7.39		2535	7.90		6922	4386
Total Land	4.20						
Crop Int'y	175%						
Family	6						
Adult	4						
Children	3						
Hr/Day	8						
Econ Rent	1800						
OwnerCash for 4.2 feddan			2535			6922	
TenantCast for 4.2 feddan			735			5122	

F Value = Feddan * net income of Crop Production Model
 where Feddan follows the same cropping patterns
 in Hares area, 1995, as indicated in column 2,
 Wheat:36, Beans:11, L Bersh'm:21, S Bersh'm:17,
 Veg(W):12, Cotton:17, Maize:36, Sunflower:8, Veg(S):37

Future Cropping Patters:
 Wheat:28, Beans:5, L Bersheem:15, S Bersheem:25, Veg(W), 14
 Cotton: 22, Maize:28, Sunflower:1, Veg(S):18, Citrus:13
 Net income wo/project was taken from net income corresponding
 to F Value WO/Proj while net income W/Project was from the
 last colom Yr4 with project, Tables I-2-37 thru I-2-46

Table I-2-61 Summary of Costs and Benefits in Omoum Area

1. Total Area:	315,800	feddan	Family:	16,900
2. Population:	95,840		Farm Fam	11,100
3. Net Crop Yields:		Year 1		Year 9-50
F Value(Mill LE)		0		292.59
E Value(Mill LE)		0		312.49
4. Farm Budget:		WO/Proj	W/Proj	Diff
4.2 fed/farm				
F Value(LE)		2,535	6,922	4,386
5. Other Benefits:		Tourists Attraction to Maruit lake Fish Production in Maruit lake Environment Quality Improvement		
5. NPV of Crop Yields @Dis=12%:		F Value	E Value	
Benefits accrue Year 6				
Full Benefits Year 9-50(Mill LE)		1117.99	1251.08	
6. Internal Rate of Return		FIRR	EIRR	
315800 feddan		21.95	23.02	
7. Sensitivity				
Benefits 20% Down		18.11	19.06	
2 Year Delay		16.75	17.47	
Project Cost 20% Up		18.67	19.64	

- Notes:
- 1. Social Discount Rate = 12%.
 - 2. Standard Conversion Factor of Foreign Portion of Project Costs = 0.87
 - 3. Net Crop Value = (Yield/fed)*(Difference in Value between W/Proj and WO/Proj)* F(E) Value, Table I-2-49
 - 4. Last two columns of Diff in F Value(E Value), Table I-2-49
 - 5. Table I-2-60, Farm Budget Production Model in Omoum
 - 6. Last two columns of Net PV, Table I-2-59
 - 7. FIRR,EIRR of Table I-2-58
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J. ENVIRONMENT

ANNEX J. ENVIRONMENT

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Table J - 1 - 1 Total Fish Production of Mariut Lake by Kilo

Year Month	1985	1986	1987	1988	1989	1990	1991	1992	1993
Jan	752,325	281,600	684,827	257,710	264,490	88,203	85,117	232,847	367,152
Feb	429,973	378,604	384,711	282,460	212,669	104,406	97,907	183,710	287,187
Mar	287,538	374,883	298,285	216,145	126,097	137,796	119,340	171,498	165,133
Apr	312,518	483,065	398,479	263,574	148,052	138,511	104,987	162,283	206,786
May	345,655	494,256	366,391	265,201	199,551	185,484	207,642	279,700	215,184
Jun	474,496	561,975	336,466	309,550	230,159	214,093	230,196	181,270	343,212
Jul	498,776	681,693	399,369	292,400	187,247	163,692	252,454	232,627	375,198
Aug	654,321	574,719	327,379	303,888	208,531	195,958	200,641	347,668	367,305
Sep	656,069	468,636	294,257	246,759	165,896	159,736	163,675	342,544	332,591
Oct	536,762	463,566	247,676	231,919	157,270	127,438	186,160	337,718	320,684
Nov	358,283	434,974	246,691	174,750	129,769	96,600	12,881	305,253	250,650
Dec	274,796	405,265	255,300	195,238	107,122	93,710	17,879	315,602	205,457
	5,830,560	5,603,236	4,239,831	3,039,594	2,136,853	1,705,627	1,955,790	3,092,720	3,436,539

Species by Kilo

SPECIES	1985	1986	1987	1988	1989	1990	1991	1992	1993
TILAPIA	5,154,280	5,022,752	3,485,753	2,535,789	1,705,819	1,501,607	1,745,384	2,378,994	2,530,315
CAT FISH	617,455	498,513	666,538	442,293	372,292	162,453	166,872	609,256	774,839
EELS	20,012	32,310	38,290	30,165	24,923	13,441	14,249	13,507	15,160.5
MUGIL C.	37,783	25,571	34,019	25,360	25,693	18,121	25,533	32,239	28,141
MUGIL	1,030	9,721	6,804	6,387	8,126	10,005	3,752	24,252	36,387
CARP	5,830,560	5,603,236	4,239,831	3,039,594	2,136,853	1,705,627	1,955,790	3,092,720	3,436,539

Data Source; General Authority for Fish Resources Development, 1994.

(Water Area; 16,000 feddan = 6,720ha)

Table J - 1 - 2 Nozha Hydrodroom Seasonal Fish Production

SEASON	MULLETS		TILAPIAS		CARP & OTHERS		Total TON
	TON	%	TON	%	TON	%	
75/76	30.95	54.76	1.26	2.23	24.31	43.01	56.51
76/77	24.27	40.31	1.36	2.26	34.58	57.43	60.21
77/78	23.22	55.37	7.44	17.73	11.27	26.89	41.92
78/79	6.56	22.02	10.03	33.63	13.22	44.35	29.81
79/80	23.37	46.06	16.88	33.27	10.49	20.68	50.74
80/81	24.74	33.23	25.97	34.89	23.74	31.89	74.45
81/82	20.47	50.03	5.22	12.76	15.23	37.21	40.92
82/83	33.48	39.47	18.41	21.70	32.92	38.82	84.81
83/84	58.05	53.98	21.58	20.07	27.91	25.95	107.54
84/85	133.76	58.87	56.11	24.70	37.33	16.43	227.19
85/86	62.65	29.18	123.87	57.70	28.15	13.11	214.66
86/87	21.92	20.68	27.69	26.12	56.38	53.20	105.99
87/88	2.35	0.42	519.33	92.37	40.57	7.22	562.25
88/89	43.83	17.58	141.10	56.59	64.41	25.83	249.34
89/90	50.52	15.10	193.93	57.98	90.05	26.92	334.51
90/91	51.05	14.91	192.08	56.09	99.33	29.01	342.46
91/92	15.57	7.11	92.28	42.11	111.28	50.78	219.13
92/93	5.71	5.08	8.67	7.71	98.08	87.21	112.45

Data Source: Egyptian Fishery Company, Aug. 1994 (Water Area 1,200 feddan = 504ha)

Table J - 1 - 3 Annual Fish Production of Alexandria Governorate Fish Farm

Period (year)*	Tilapia SP. (kg)	Mullet (kg)	Catfish (kg)	Carp (kg)	Others (kg)**	Total (kg)
1991/1992	13,722.25	5,200.00	1,540.50	68.50	1,764.25	22,295.50
1992/1993	12,545.79	5,867.90	5,667.00	4,277.00	347.00	28,704.69
1993/1994	13,103.50	5,670.09	6,265.00	7,332.94	20.00	32,391.53

* From July to June

** Eel, Bagarus byad and Labeo niloticus

Data Source; Alexandria Governorate Fish Farm, Aug. 1994

(Water Area 120 Feddan = 50.4 ha)

Table J - 1 - 4 Fisherman and Fishing Boat in the Mariut Lake

Items	Year		
	1990	1991	1992
Boat	1,830	1,688	1,887
Fisherman	5,490	5,064	5,661

Data Source; General Authority for Fish Resources project, Aug. 1994.

Table J - 1 - 5 Water Quality of Lake Mariut (1990)

Location	P. H	Dissolved Oxygen (mg/ℓ)	Alkalinity (mg/ℓ)	Salinity (‰)	Water Depth (m)
Main Body (5,200 fed)	8	3.08	300	2.8	0.3~1.10
N. T (750fed)	8	3.12	320	1.0~5.0	0.50~1.10
M. T (138fed)	8	1.23	340	3.5	0.20~0.95
N.W (3,000fed)	8~9	2.08	230~270	4.1~5.8	0.3~1.20
S. E (306fed)	7.5	0.5	260	7.0	0.5~1.10
S. (1,000fed)	7.5~8.5	3.12~4.16	350~360	2.6~3.6	0.4~1.10
S. W (6,000fed)	8~8.5	2.08~4.16	140~230	3.6~19.2	0.25~1.20
Sui table Ratio	6.5~9	4<	65~250	0.1~17.0	

Data Source ; General Authority for Fish Resources Development

Main Body ; East Basin of Mariut Lake
 N. T ; Northern Triangle Basin
 M. T ; Middle Triangle Basin
 N. W ; North-West Basin
 S. E ; South-East Basin
 S ; Southern Basin
 S. W ; South-Western Basin

Table J - 1 - 6 Chemical Analysis of Nozha Hydrodrome Water (1993)

Month	Temp. C°	Ph	Total Alk. Mg/L	Do Mg/L	Total (N) Mg/L	Reactive (P) Mg/L
Jan	14.00	8.36	280.00	9.00	0.27	0.09
Feb	15.00	8.37	280.00	8.00	0.26	0.08
Mar	20.00	8.31	340.00	6.50	0.24	0.08
Apr	21.00	8.40	340.00	6.50	0.24	0.08
May	22.00	8.40	350.00	7.00	0.37	0.25
Jun	27.00	8.40	330.00	7.00	0.36	0.24
Jul	28.00	8.40	350.00	7.00	0.22	0.23
Aug	27.00	8.40	360.00	7.00	0.25	0.31
Sep	25.00	8.40	330.00	7.00	0.20	0.25
Oct	24.00	8.40	340.00	6.50	0.30	0.25
Nov	18.00	8.30	280.00	7.30	0.45	0.11
Dec	17.00	8.40	260.00	7.50	0.35	0.10

* Samples were collected AT 10 AM.

* Data Source ; Egyptian Fishery Co, Aug. 1994

Table J - 1 - 7 Monthly Average Water Quality at Alexandria Treatment Plant

(unit : mg/l)

Date	Flow (m ³ /d)	TSS		BOD		COD		P.H		D.O	
		Inflow	outflow	Inflow	outflow	Inflow	outflow	Inflow	outflow	Inflow	outflow
East Treatment Plant (ETP)											
July '94	418,294	271.7	101.1	188.7	123.3	-	-	-	-	-	-
West Treatment Plant (WTP)											
Feb. '94	176,429	-	-	539.8	181.9	1,434	449.4	7.4	4.9	3.5	3.5
June '94	-	-	-	560.2	144.5	1,498	369.2	7.2	4.1	3.4	3.4

Data Source : East and West Treatment plant, Alexandria General Organization for Sanitary Drainage, July, 1994

Table J - 1 - 8 Classification of Eutrophication

Characteristic	Category	Over Eutrophication		Eutrophication water	Origotrophic water
		Depth > 5m	Depth < 5.0m		
[Water Quality]					
- Transparency (m)		1.5 >	3.0 >	3~10	10 <
- Water color		Blackish	Yellow, Yellow green, Red Brown	Short Time, Partially	Color less
- COD (ppm)		10 <	3~10	1~3	1 >
- BOD (ppm)		10 <	3~10	1~3	1 >
- Inorganic N compound (Mgat N/ℓ)		100 <	10~100	2~10	2 >
- (mg/ℓ)		(1.4)	(0.14~1.4)	(0.028~0.14)	(0.028)
- Dissolved Oxygen (%)		Surface (100)	SRF (100~200)	SRF, MDL (100)	All Layer
		Bed (0)	(0~30)	Bed (30~80)	(80~100)
[Bed Quality]					
- Color		Black, Not Brown oxidized	Black Oxidized	Some Time Blackish and Oxidized	Not Black, Oxidized Layer
- Sulfide (mg/ℓ)		1.0 <	No Oxidation	0.03~0.3	0.03 >
- COD (mg/ℓ)		-	0.3~3.0	5~30	5 >
			30 <		
- Microscopic Bacteria (MPN/mℓ)		10 ⁵ <	10 ³ ~10 ⁵	10 ² ~10 ³	10 ² >
- Plant plankton (N/mℓ)		10 ³ >	10 ³ ~10 ⁵	10 ² ~10 ³	10 ² >
		few species	few species	many species	many species

Data Source ; Dr. Youichi YOSHIDA, KYOTO University, Eutrophication in the Hydrosphere and aquaculture, Japan Fisheries Society

Table J - 1 - 9 Water Quality Standard for Drain

Items	Japan (Environmental Basic Law)			Egypt (Law No 48, 1982)	
	Permissible Limit (Drain)	Environment standard		Sanitary Drainage	Industrial Fluid
		River	Lake		
- Hydrogen Ion Activity (PH)	5.8~8.6 5.0~9.0 (Sea Area)	6.0~8.5	6.0~8.5	6~9	6~9
- Chemical Oxygen Demand (COD)	120 mg/l (Daily Av.)	-	1~8	40	50
- Biochemical Oxygen Demand (BOD)	120 mg/l (Daily Av.)	1~10	-	-	-
- Suspended Solids (SS)	150 mg/l (Daily Av.)	25~100	1~15	50	60
- Total Nitrogen (T-N)	60 mg/l (Daily Av.)	-	1	50	40
- Total phosphorus (T-P)	8 mg/l (Daily Av.)	-	0.1	-	10
- Dissolved Oxygen (DO)	-	7.5~2.0	7.5~2.0	4	-
- Total count of Coliform bacteria	3,000 MPN/cm ³	5,000(MPN/100cm ³)	1,000	5000	5000

Table J - 1 - 10 Water Quality Criteria of Fish Farm

Items	Alexandria Fish Farm 1)	Lake Mariut (Suitable Quality) 2)
Water Temperature °C	14.2~30.0	-
Salinity (chloride) g/l	1.1~1.6	0.1~17.0 (Brackish Water)
pH	7.0~8.9	6.5~9.0
Dissolved Oxygen mg/l	5.4~8.5	4<
NH ₃ - N mg/l	0.08~0.54	-
PO ₄ - P mg/l	0.012~0.133	-
Alkalinity mg/l	-	65~250

1) : Alexandria Governarate Fish Farm

2) : Report for Water Quality Analysis of Lake Mariut (General Authority for Fish Resources)

TABLE J-1-11 CHECKLIST FOR SCOPING

- 1) Applicable development activities (from PD)
 - : Irrigation, Drainage, Land clearing & leveling, Sea/swamp reclamation, Land consolidation, New land settlement, Dam and reservoir, Substantial change in farmin-system
- 2) Applicable development type
 - : New project, rehabilitation
- 3) Applicable environmental sensitive area (from SD)
 - : Arid and semi-arid lands, Tropical rain forests, wildlands, wetlands, Peatlands, Coastal zones, Mangrove forests, Coral reefs, Mountainous/steep sloped/ credible/ devastatedlands, Closed water bodies in upstream or downstream.

(Irrelevant items in the above are deleted)

I. Social Environment

Categories of Environmental Impact		Evaluation				Evaluation Basis
		A	B	C	D	
1	Planned residential settlement	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential in the project
2	Involuntary resettlement	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential in the project
3	Substantial changes in way of life	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential in the project
4	Conflict among communities and peoples	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential in the project
5	Impact on native peoples	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
6	Population increase	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not new development project
7	Drastic change in population composition	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not new development project
8	Changes in bases of economic activities	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Existing fishery to be studied
9	Occupational change and loss of job opportunity	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Relationship between water level and fishery to be studied
10	Increase in income disparities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Farm economy to be studied
11	Adjustment & regulation of water or fishing (riparian) rights	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fishery Right to be investigated
12	Changes in social and institutional structures	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
13	Changes in existing institutions and customs	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential

I. Social Environment (continued)

Categories of Environmental Impact		Evaluation				Evaluation Basis
		A	B	C	D	
14	Increase use of agrochemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not expected in the project
15	Outbreak of endemic diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not expected in the project
16	Spreading of endemic diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not expected in the project
17	Residual toxicity of agrochemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not expected in the project
18	Increase in domestic and other human wastes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not expected in the project
19	Impairment of historic remains and cultural assets	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
20	Damage to anesthetic sites	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
21	Impairment of buried assets	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable

II. Natural Environment

Categories of Environmental Impact		Evaluation				Evaluation Basis
		A	B	C	D	
22	Changes in vegetation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No SEI is foreseen for the project
23	Negative impacts on important or indigenous fauna and flora	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
24	Degradation of ecosystems with biological diversity	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No SEI is foreseen in the project
25	Proliferation of exotic and/or hazardous species	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
26	Destruction of wetlands and peatlands	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Impact may be insignificant
27	Encroachment into tropical rain forests and wildlands	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
28	Destruction or degeneration of mangrove forests	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
29	Degradation of coral reefs	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable
30	Soil erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No SEI is foreseen by the project
31	Soil salinization	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will be improved
32	Deterioration of soil fertility	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No SEI is foreseen by the project
33	Soil contamination by agrochemicals and others	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No SEI is foreseen by the project

II. Natural Environment (continued)

Categories of Environmental Impact		Evaluation				Evaluation Basis
		A	B	C	D	
34	Devastation or desertification of land	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
35	Devastation of hinterland	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
36	Ground subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Further study to be done
37	Changes in surface water hydrology	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Depending on drainage plan Detail study is needed in project area
38	Changes in groundwater hydrology	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Depending on drainage plan Detail study is needed in project area
39	Inundation and flooding	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will be improved by the project
40	Sedimentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
41	Riverbed degradation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
42	Impediment of inland navigation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Impact to fisherman to be studied
43	Water contamination and deterioration of water quality	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Quality of Mariut lake water to be studied
44	Water eutrophication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Present situation is under study
45	Sea water intrusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Further study to be done
46	Changes in temperature of water	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No potential
47	Air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Attention needed in construction
48	Damage to landscape	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not new development project
49	Impediment of mining resources exploitation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable

1/ Applicable columns with the following impact degree are marked

(SEI: Significant Environmental Impact)

- A: The subject SEI is unquestionably induced by the project
- B: The subject SEI is likely to be induced by the project
- C: There is no possibility of the subject SEI being induced by the project
- D: The SEI is not fully known

TABLE J - 1 - 12 OVERALL EVALUATION

Categories of Environmental Impact	Overall Evaluation	Necessary study Items and Evaluation Bases
8. Change in bases economic activities	B	Existing fishery to be studied
9. Occupational change and loss of job opportunity	B	Relation between water level and fishery to be studied
11. Adjustment & regulation of water or fishery (riparian) rights	B	Fishery rights and Riparian to be investigated
37. Change in surface water hydrology	B	Depending on drainage plan, detail study is needed
38. Change in ground water hydrology	B	~ ditto ~
42. Impediment of inland navigation	B	Impact to fisherman to be studied
43. Water contamination and deterioration of water quality	B	Mariut lake water quality to be studied
44. Water eutrophication	B	Present situation to be studied
Overall evaluation (Necessity of EIA)	B (yes)	

Table J-1 - 13 Monthly Water Level of Mariut Lake

(Unit; m)

Month	1990			1991			1992			1993			1994		
	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max
Jan.	-2.44	-2.52	-2.42	-2.27	-2.40	-2.09	-2.45	-2.68	-2.20	-2.79	-2.80	-2.78	-2.80	-2.80	-2.80
Feb.	-2.51	-2.54	-2.50	-2.37	-2.52	-2.12	-2.60	-2.68	-2.56	-2.79	-2.80	-2.70	-2.80	-2.80	-2.80
Mar.	-2.47	-2.50	-2.42	-2.43	-2.52	-2.33	-2.58	-2.62	-2.50	-2.80	-2.80	-2.80	-2.80	-2.80	-2.80
Apr.	-2.46	-2.52	-2.40	-2.33	-2.38	-2.30	-2.64	-2.72	-2.55	-2.80	-2.80	-2.80	-2.80	-2.80	-2.80
May	-2.47	-2.52	-2.42	-2.39	-2.45	-2.30	-2.77	-2.90	-2.65	-2.80	-2.80	-2.80	-2.80	-2.80	-2.70
Jun.	-2.48	-2.52	-2.42	-2.43	-2.45	-2.38	-2.80	-2.81	-2.80	-2.80	-2.80	-2.80	-2.80	-2.74	-2.70
Jul.	-2.48	-2.50	-2.46	-2.40	-2.42	-2.36	-2.80	-2.80	-2.80	-2.80	-2.80	-2.70	-2.70	-2.70	-2.70
Aug.	-2.48	-2.50	-2.42	-2.39	-2.44	-2.36	-2.80	-2.82	-2.80	-2.74	-2.80	-2.70	-2.70	-2.70	-2.70
Sep.	-2.44	-2.48	-2.38	-2.40	-2.45	-2.35	-2.79	-2.80	-2.75	-2.70	-2.70	-2.70	-2.70	-2.73	-2.75
Oct.	-2.43	-2.48	-2.40	-2.41	-2.44	-2.38	-2.80	-2.80	-2.78	-2.70	-2.78	-2.70	-2.75	-2.80	-2.54
Nov.	-2.43	-2.48	-2.40	-2.36	-2.44	-2.28	-2.80	-2.80	-2.80	-2.77	-2.78	-2.70	-2.75	-2.80	-2.80
Dec.	-2.40	-2.40	-2.41	-2.10	-2.48	-1.86	-2.78	-2.82	-2.70	-2.79	-2.80	-2.78	-2.77	-2.80	-2.60

Data Source ; El Max pump station, Feb 1995

Table J - 2 - 1 Water Quality (EC) of Omoum Drain System

Observation Site	EC (mS/cm)	EC (mS/cm)	Water Tep.	Date	Remarks
	1994	1995			
Discharge-Channel	-	9.98	18.1	Mar. 1	
U-1 El Max Pump	8.27	7.46	14.8	Feb. 12	
U-2 Omoum Syphon	4.80	5.38	16.1	Feb. 12	
		6.98	16.2	Feb. 22	
M1 Lake Mariut (NE)	3.10	6.51	16.5	Feb. 22	d=1.50 m
M2 Lake Mariut (SE)	6.70				
M3 Lake Mariut (W)	11.40	12.69	17.1	Feb. 22	d=1.30 m
U-3 Abis Pump	9.18	15.95	18.1	Feb. 27	
U-4 Omoum-Abis	3.78	6.99	18.3	Feb. 27	
U-5 Dishudi Pump	4.50	5.99	18.2	Feb. 27	
U-6 Hares Pump	11.30	16.53	16.6	Feb. 12	
		11.74	17.8	Feb. 27	
U-7 Nubariya. C. 100 km	2.25	1.41	16.1	Feb. 12	
U-8 West Nubariya D.	5.16	5.36	15.8	Feb. 12	
		4.84	17.8	Feb. 26	
D-1 Qalla Pump	2.49	3.16	20.9	Feb. 27	
D-2 Omoum-Truga	2.44	4.06	18.7	Feb. 28	
D-3 Truga Pump	3.54	5.68	19.1	Feb. 28	
D-4					
D-5 Omoum-Shershura	2.14	2.84	19.2	Feb. 28	
D-6 Shereshura Pump	2.21	2.91	19.1	Feb. 28	
D-7 Shereshura Drain	1.57	2.61	19.1	Mar. 1	
D-8 Abu Hommos Pump	1.99	2.57	18.2	Feb. 28	
S1 Nubariya Canal	0.38	0.51	18.6	Feb. 25	
S2 Mahmoudia Canal	0.40	0.19	19.7	Feb. 27	

Table J - 2 - 2 Fluctuation of Mariut Lake Water Level

(Unit: m)

Year	Maximum	Average	Minimum	Maxium Occur Month
1966.67	-2.75	-2.88	-3.01	Sep.
1967	-2.71	-3.01	-3.31	Sep.
1978	-2.51	-3.11	-3.31	Jul.
1979	-3.01	-3.15	-3.31	Jul.
1980	-2.71	-3.01	-3.25	Apr.
1990	-2.38	-2.45	-2.54	Sep.
1991	-1.86	-2.45	-2.52	Dec.
1992	-2.21	-2.71	-2.91	Jan.
1993	-2.71	-2.75	-2.81	Sep.
1994	-2.54	-2.77	-2.81	Nov.

Table J-2-3 Quantity and Quality of New-reuse (Mixed) Water in 1994

(Unit: MCM)

Month	Reuse-Q (1)	EC (ppm) (2) (EC*0.64)	Reuse-Lod (3) (1)*(2)	Nil-Wtr-Q (4)	EC (ppm) (5)	Nil-Q-Ld (6) (4)*(5)	Mixed-Q (7) (1)+(4)	Mix-Q-LD (8) (3)+(6)	EC (ppm) (9) (8)/(7)	EC(mS/cm) (10) (9)/640
Jan.	44	2,090	91.96	166	218	36.19	210	128.15	610	0.953
Feb.	33	2,090	68.97	187	218	40.77	220	109.74	499	0.779
Mar.	88	2,090	183.92	267	218	58.21	355	242.13	682	1.066
Apr.	91	2,090	190.19	309	218	67.36	400	257.55	644	1.006
May	79	2,090	165.11	361	218	78.70	440	243.81	554	0.866
Jun.	69	2,090	144.21	401	218	87.42	470	231.63	493	0.770
Jul.	85	2,090	177.65	445	218	97.01	530	274.66	518	0.810
Aug.	100	2,090	209.00	370	218	80.66	470	289.66	616	0.963
Sep.	114	2,090	238.26	326	218	71.07	440	309.33	703	1.098
Oct.	104	2,090	217.36	256	218	55.81	360	273.17	759	1.186
Nov.	57	2,090	119.13	244	218	53.19	301	172.32	572	0.895
Dec.	61	2,090	127.49	239	218	52.10	300	179.59	599	0.935
Total	925		1933.25	3,571		778.48	4,496	2,711.73		
Average	77.08	2,090			218				604	0.944

Table J-2-4 Drain Water Salinity in the Project Area

Month	1) Omoum after Truga Outlet		2) Omoum Syphon		3) Nile-Nubria Canal		4) El-Max Outlet	
	EC (mS/cm)	EC (ppm)	EC (mS/cm)	EC (ppm)	EC (mS/cm)	EC (ppm)	EC (mS/cm)	EC (ppm)
Aug. 1994	3.300	2,112	6.21	3,973	0.30	192	9.12	5,837
Sep. 1994	2.440	1,561	4.80	3,072	0.38	243	8.27	5,293
Feb. 1995	4.060	2,598	6.18	3,955	N.A	N.A	7.46	4,774
Ave.	3.266	2,090	5.73	3,667	0.34	218	8.28	5,301

Table J-2-5 Water Quarity (EC) of Omoum Drain After Resue Project

(Unit: Discharge; MCM, Load; 1,000 ton)

Month	D/S-TRUG (1) (MCM)	EC (ppm) (2) EC*0.64	LOAD (TON) (3) (1)*(2)	DIS-REUSE (4) (MCM)	REUSE (%) (5) (4/1)*100	AF-RS-LD (6) (3)*(1-p)	D/S-OMUM (7) (MCM)	EC (ppm) (8) EC*0.64	D/S-LOD (9) (7)*(8)
Jan.	86.21	2.090	180.2	44	51.0	88.2	127.34	3,667	466.96
Feb.	40.50	2.090	84.6	33	81.5	15.7	65.72	3,667	241.00
Mar.	88.08	2.090	184.1	88	99.9	0.2	117.61	3,667	431.28
Apr.	93.76	2.090	196.0	91	97.1	5.8	114.54	3,667	420.02
May	86.93	2.090	181.7	79	90.9	16.6	107.16	3,667	392.96
Jun.	69.01	2.090	144.2	69	100.0	0.0	94.93	3,667	348.11
Jul.	92.63	2.090	193.6	85	91.8	15.9	124.56	3,667	456.76
Aug.	100.88	2.090	210.8	100	99.1	1.8	126.72	3,667	464.68
Sep.	114.69	2.090	239.7	114	99.4	1.4	147.69	3,667	541.58
Oct.	104.66	2.090	218.7	104	99.4	1.4	144.27	3,667	529.04
Nov.	109.10	2.090	228.0	57	52.2	108.9	154.81	3,667	567.69
Dec.	77.61	2.090	162.2	61	78.6	34.7	109.85	3,667	402.82
Total	1,064.06		2,223.9	925	86.9	290.6	1435.20		5262.88
Average	88.67	2.090					119.60	3,667	

(Unit: Discharge; MCM, Load; 1,000 ton)

BTW-LOD (10) (9)-(3)	AFT-D/S-Q (11) (7)-(4)	AFT-D/S-L (12) (6)+(10)	AFTD/S-EC (13) (12)/(11)	LAKE-INT (14) (20 cumec)	BF-INT-LD (15) (14)*(8)	AF-INT-LD (16) (14)*(13)	REUSE-IMP Intake-Q (16)/(15)%	LAKE- INFLW (18)	REUSE-IMP Lake-W-Qul 14*17/18
286.78	83.34	375.00	4500	53.57	196.44	241.04	23	200.13	6
156.35	32.72	172.03	5257	48.38	177.41	254.36	43	127.16	17
247.19	29.61	247.36	8354	53.57	196.44	447.51	128	184.56	37
224.06	23.54	229.83	9763	51.84	190.10	506.13	166	181.93	47
211.27	28.16	227.85	8091	53.57	196.44	433.44	121	179.35	36
203.88	25.93	203.88	7863	51.84	190.10	407.60	114	155.68	38
263.16	39.56	279.11	7055	53.57	196.44	377.96	92	195.20	25
253.84	26.72	255.68	9569	53.57	196.44	512.61	161	194.93	44
301.88	33.69	303.32	9003	51.84	190.10	466.73	146	213.87	35
310.30	40.27	311.68	7740	53.57	196.44	414.62	111	201.80	29
339.67	97.81	448.56	4586	51.84	190.10	237.74	25	227.76	6
240.62	48.85	275.33	5636	53.57	196.44	301.93	54	173.37	17
3038.99	510.2	3329.61	7285	630.73	192.74	383.47	98	2,235.84	
								186.32	28

Table J-2-6 Omoum Drain Discharge in 1994

(Unit: MCM)

Month	Abu-Hommos	Shereshra	Truga	Sub-total	Dishudi	Hares	Abis	Total	R-USE; MRT	HRS- DRCT	HRS- INTK	INFL- MLAKE
Jan.	6.98	48.16	31.07	86.21	16.07	43.40	3.00	148.68	5.27	10.71	5.36	127.34
Feb.	3.87	17.52	19.11	40.50	10.83	29.56	2.35	83.24	3.00	9.68	4.84	65.72
Mar.	7.83	48.34	31.91	88.08	15.72	39.14	3.14	146.08	12.40	10.71	5.36	117.61
Apr.	9.35	53.18	31.23	93.76	15.55	39.00	2.90	151.21	8.16	18.14	10.37	114.54
May	8.70	48.64	29.59	86.93	14.45	39.76	3.01	144.15	7.54	18.74	10.71	107.16
Jun.	7.20	35.16	26.65	69.01	13.77	43.48	3.46	129.72	6.28	18.14	10.37	94.93
Jul.	10.12	52.64	29.87	92.63	19.87	46.35	3.67	162.52	8.51	18.74	10.71	124.56
Aug.	9.63	59.98	31.27	100.88	19.18	41.31	4.87	166.24	10.07	18.74	10.71	126.72
Sep.	13.13	65.45	36.11	114.69	20.60	47.54	5.18	188.01	11.81	18.14	10.37	147.69
Oct.	10.25	57.78	36.63	104.66	16.47	45.85	4.21	171.19	10.85	10.71	5.36	144.27
Nov.	10.25	58.89	39.96	109.10	17.57	49.58	4.61	180.86	10.50	10.37	5.18	154.81
Dec.	6.46	44.56	26.59	77.61	13.47	33.71	3.45	128.24	2.32	10.71	5.36	109.85
Total	103.77	590.30	369.99	1,064.06	193.55	498.68	43.85	1,800.14	96.71	173.53	94.70	1,435.20
Average	8.65	49.19	30.83	88.67	16.13	41.56	3.65	150.01	8.06	14.46	7.89	119.60

Table J - 2 - 7 Inflow of Mariut Lake in 1994

(Unit: MCM)

Month	Run-off	WTP	Qalla-P	Hars-Drct	Omo-Q-80%	Sea-Intr	Sub-total (A; Om-80%)	Nbria-lock
Jan.	2.95	5.27	22.43	10.71	127.34	1.69	170.39	8.20
Feb.	0.19	4.94	20.68	9.68	65.72	1.53	102.74	7.40
Mar.	2.01	5.96	24.54	10.71	117.61	1.69	162.52	8.20
Apr.	0.00	5.94	22.78	18.14	114.54	1.64	163.04	8.92
May	0.00	5.78	25.43	18.74	107.16	1.69	158.80	9.21
Jun.	0.00	5.36	20.79	18.14	94.93	1.64	140.86	8.92
Jul.	0.00	6.89	26.88	18.74	124.56	1.69	178.76	9.21
Aug.	0.00	7.02	27.53	18.74	126.72	1.69	181.70	9.21
Sep.	0.00	5.94	27.65	18.14	147.69	1.64	201.06	8.92
Oct.	0.28	6.08	26.65	10.71	144.27	1.69	189.68	8.20
Nov.	7.20	5.99	24.55	10.37	154.81	1.64	204.56	7.93
Dec.	4.67	6.58	20.24	10.71	109.85	1.69	153.74	8.20
Total	17.30	71.75	290.15	173.53	1,435.20	19.92	2,007.85	102.52
Average	1.44	5.98	24.18	14.46	119.60	1.66	167.32	8.54

(Unit: MCM)

Escape	LckBy-pass	Amr-Drn-Q	Nbra-Total (B)	INFL-MLKE (A)+(B)
11.93	5.45	4.16	29.74	200.13
7.57	5.82	3.63	24.42	127.16
9.73	0.00	4.11	22.04	184.56
6.08	0.00	3.89	18.89	181.93
7.32	0.00	4.02	20.55	179.35
2.01	0.00	3.89	14.82	155.68
3.21	0.00	4.02	16.44	195.20
0.00	0.00	4.02	13.23	194.93
0.00	0.00	3.89	12.81	213.87
0.00	0.00	4.02	12.22	201.90
4.62	2.61	8.04	23.20	227.76
0.09	6.25	5.09	19.63	173.37
52.56	20.13	52.78	227.99	2,235.84
4.38	1.68	4.40	19.00	186.32

Table J-2-8 Outflow of Mariut Lake

(Unit ; MCM)

Month	Evapolation		El-Max Pump	Outflow Total
	From Lake	From Omoum		
Jan.	6.77	0.15	218.79	225.71
Feb.	6.88	0.15	145.59	152.62
Mar.	8.80	0.19	177.57	186.56
Apr.	8.85	0.19	171.56	180.60
May	9.31	0.20	181.59	191.10
Jun.	9.01	0.20	135.50	144.71
Jul.	9.14	0.20	180.43	189.77
Aug.	9.14	0.20	183.33	192.67
Sep.	9.01	0.20	217.22	226.43
Oct.	8.80	0.19	215.31	224.30
Nov.	7.04	0.15	228.34	235.53
Dec.	6.26	0.14	235.35	241.75
Total	99.01	2.16	2,290.58	2,391.75
Avg.	8.25	0.18	190.88	199.31

Table J-2-9 Water Quality Balance on C. O. D (1994)

Site	Unit	COD		Average	Annual-Q (MCM)	Anm-Load (1,000ton)
		(Aug.)	(Sep.)			
(Inflow)						
Qalla	mg/lit	346.3	238.2	292.25		
	ton/day	328.3	228.4	278.35		
	Q-, 000m ³	948.0	959.0	953.50	290.2	84.7
WTP	mg/lit	449.4	369.2	409.30		
	ton/day	78.6	64.6	71.60		
	Q-, 000m ³	175.0	175.0	175.00	71.8	29.4
Sub-total	Q-, 000m ³	1,123.0			362.0	114.1
Omoum-D						
	mg/lit	14.5	24.4	19.45		
	ton/day	90.8	183.4	137.10	(Hrs-174.0)	
	Q-, 000m ³	6,264.0	7,518.0	6,891.0	1,435.2	32.0
Nubaria-C	mg/lit	26.2	21.0	23.60		
	ton/day	10.5	8.4	9.45		
	Q-, 000m ³	400.0	400.0	400.0	228.0	5.4
Total	Q-, 000m ³	7,787.0			2,199.2	151.5
(Outflow)						
El-Max-P	mg/lit	54.8	51.1	52.95		
	ton/day	338.4	386.3	362.36		
	Q-, 000m ³	6,176.0	7,560.0	6,868	2,290.6	120.9

Data: See Annex J.

FIGURE J-1-1 LOCATION MAP OF GROUNDWATER TABLE SURVEY

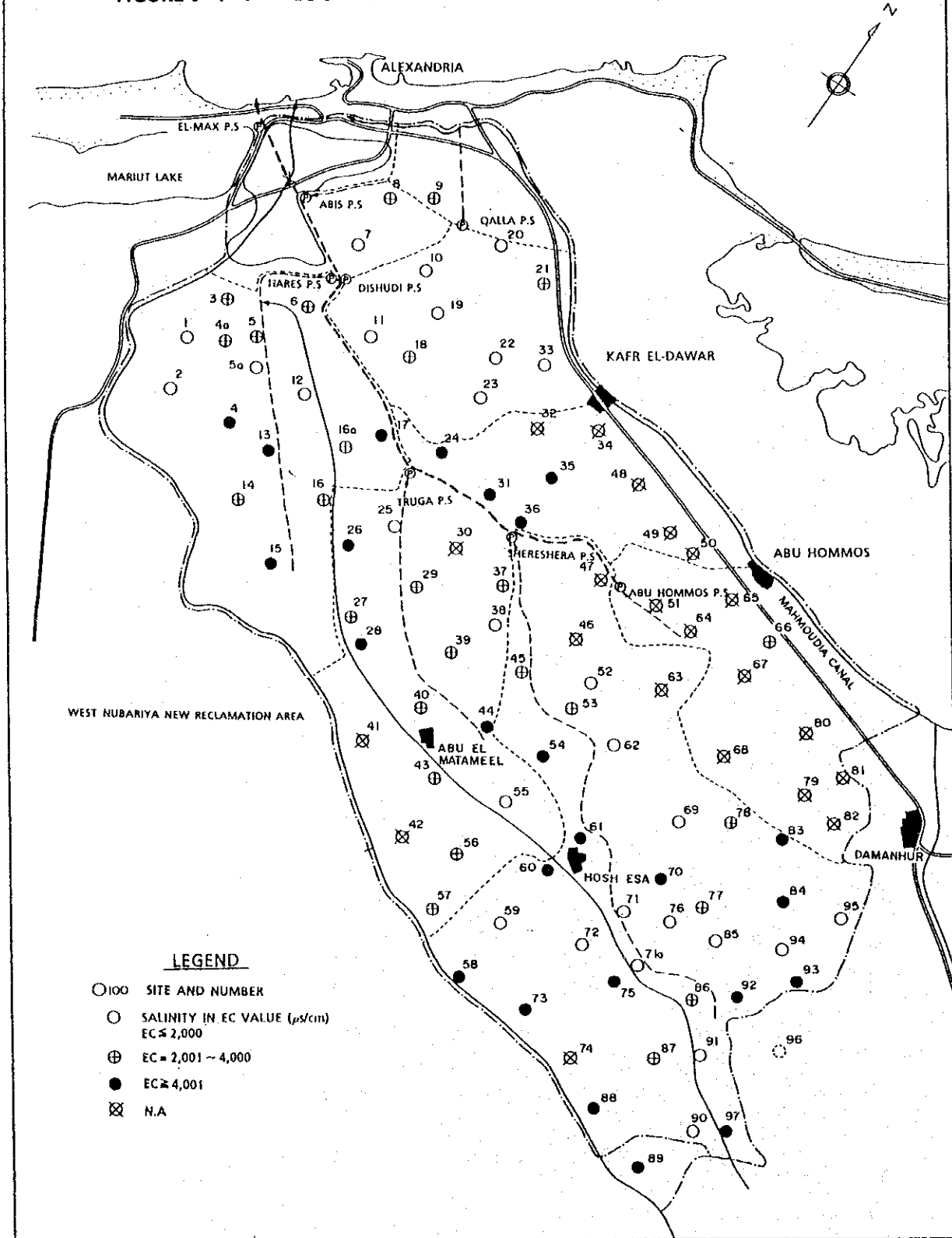
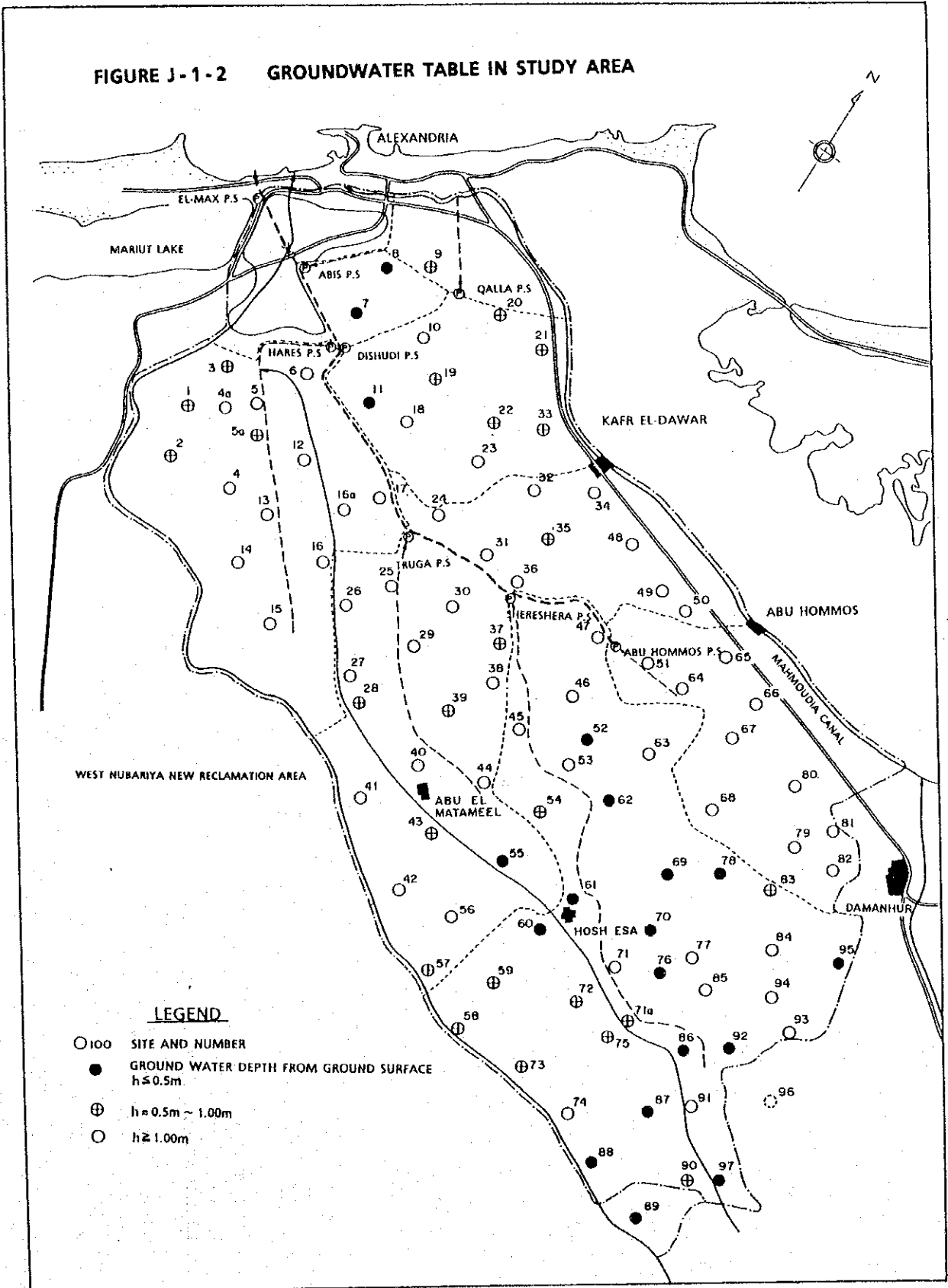


FIGURE J-1-2 GROUNDWATER TABLE IN STUDY AREA



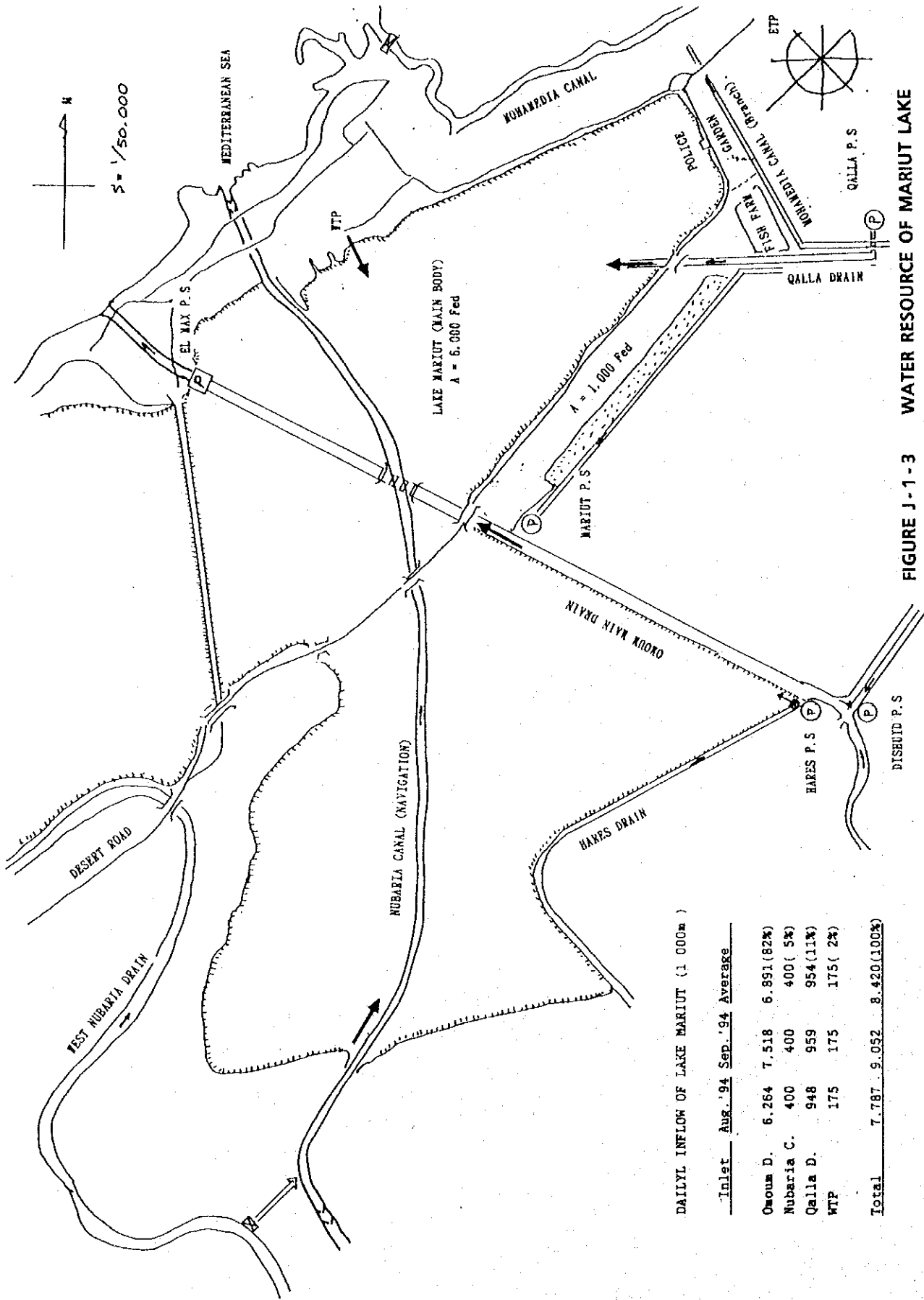


FIGURE J-1-1-3 WATER RESOURCE OF MARIUT LAKE

DAILY INFLOW OF LAKE MARIUT (1 000m)

Inlet	Aug. '94	Sep. '94	Average
Omoum D.	6.264	7.518	6.891 (82%)
Nubaria C.	400	400	400 (5%)
Qalla D.	948	959	954 (11%)
WTP	175	175	175 (2%)
Total	7.787	9.052	8.420 (100%)

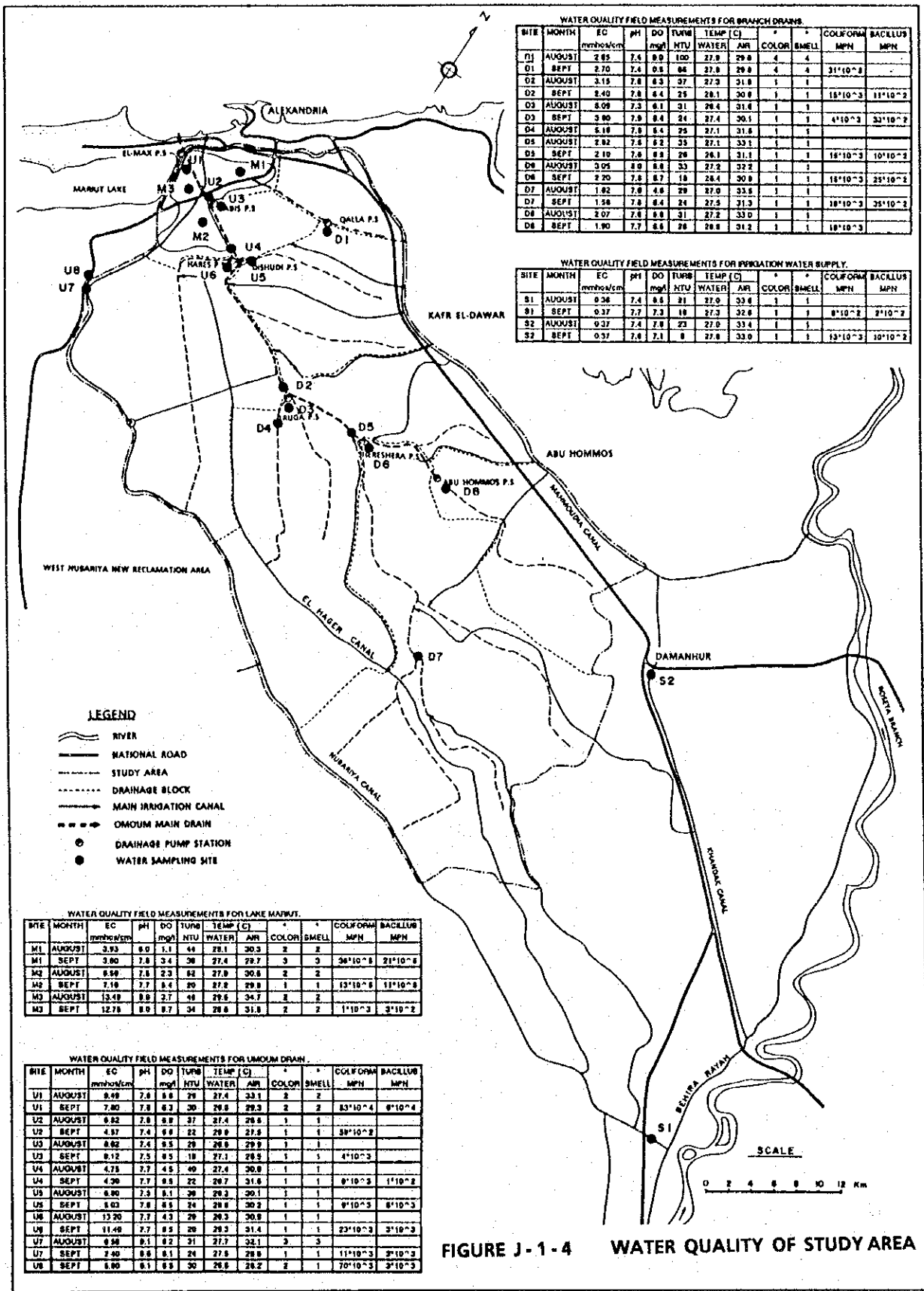


FIGURE J-1-4 WATER QUALITY OF STUDY AREA

FIGURE J-1-5 WATER QUALITY PROFILE AND LOAD (EC-1)

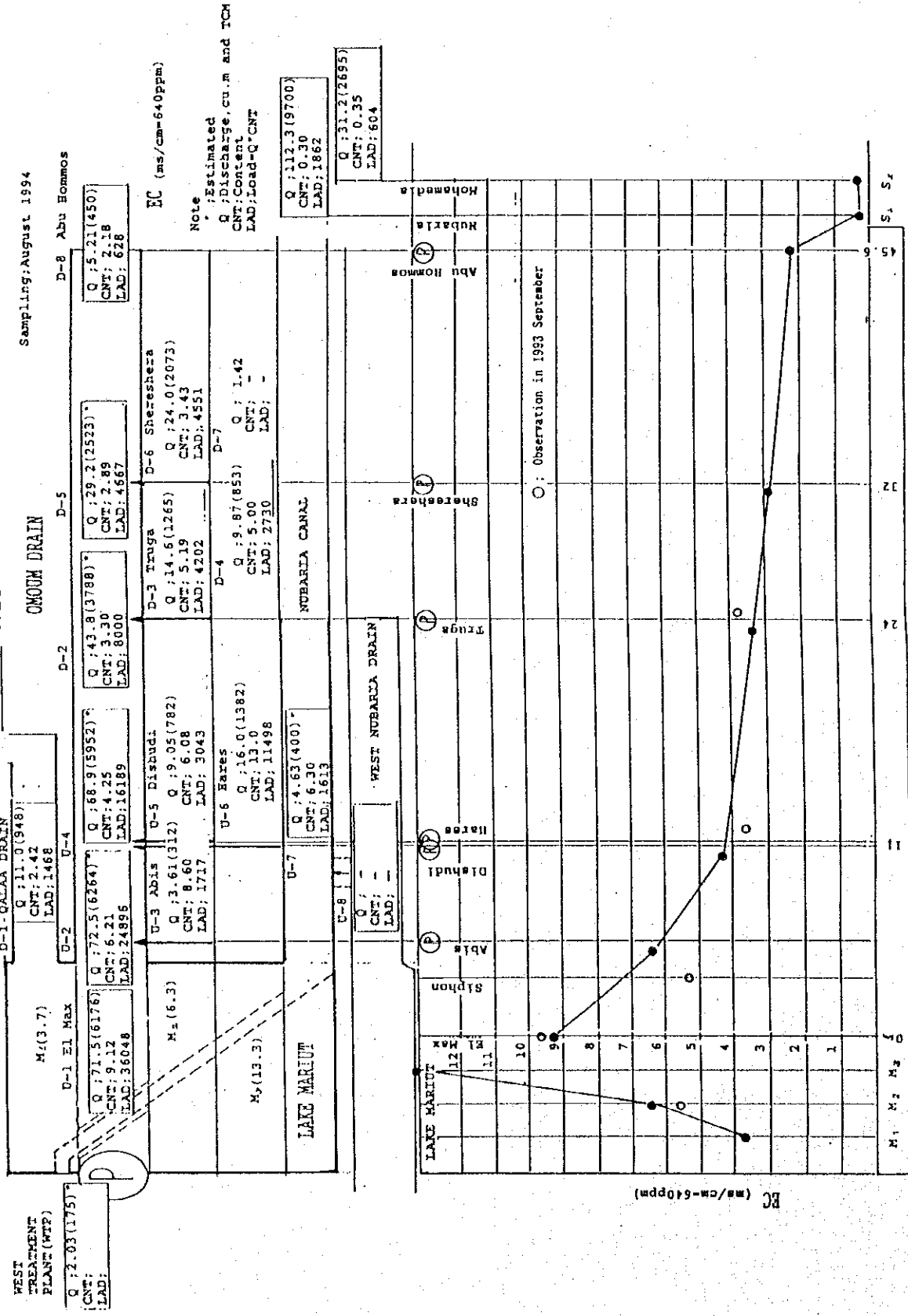


FIGURE J-1-6 WATER QUALITY PROFILE AND LOAD (EC-2)

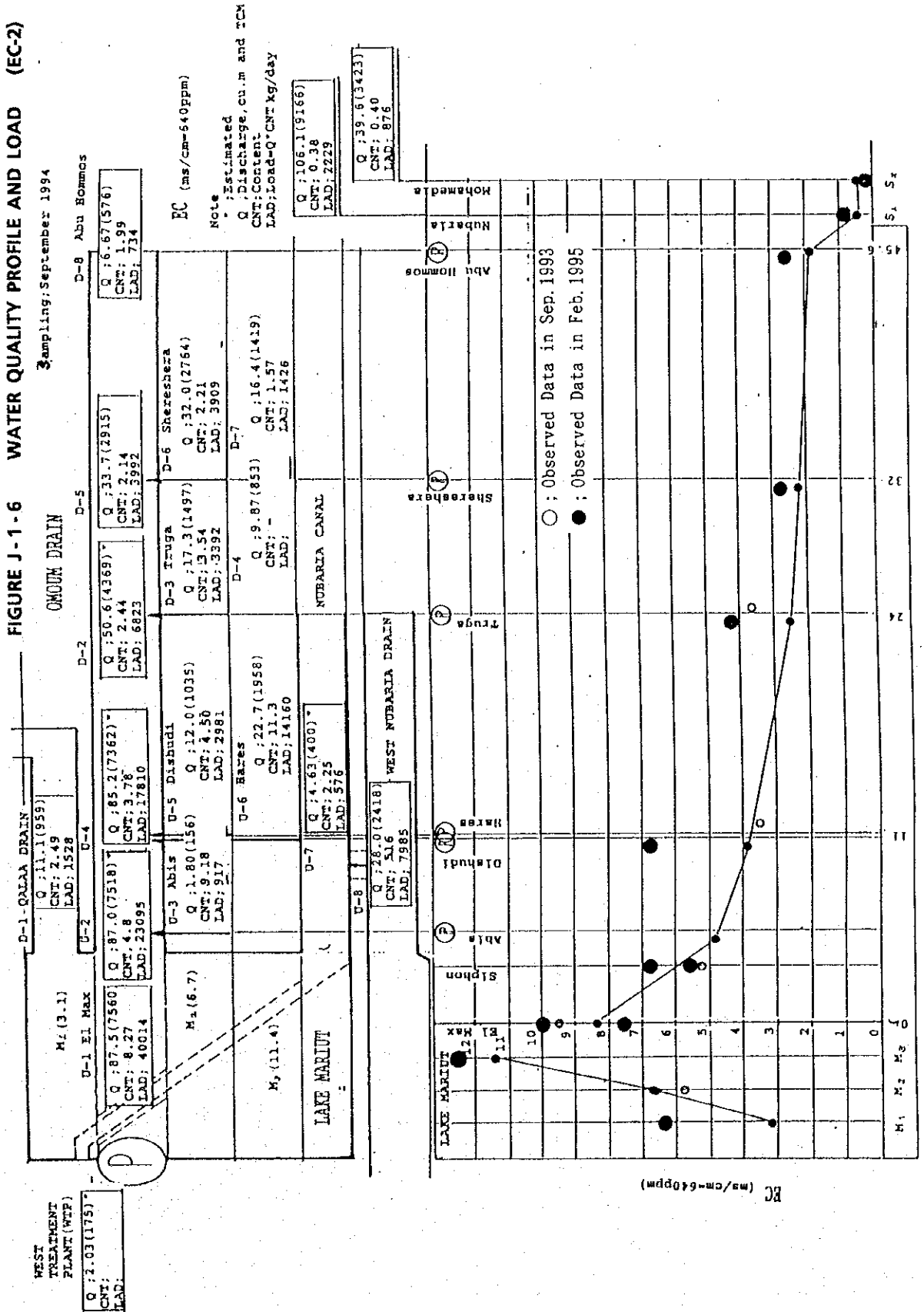


FIGURE J-1-7 WATER QUALITY PROFILE AND LOAD (DO-1)

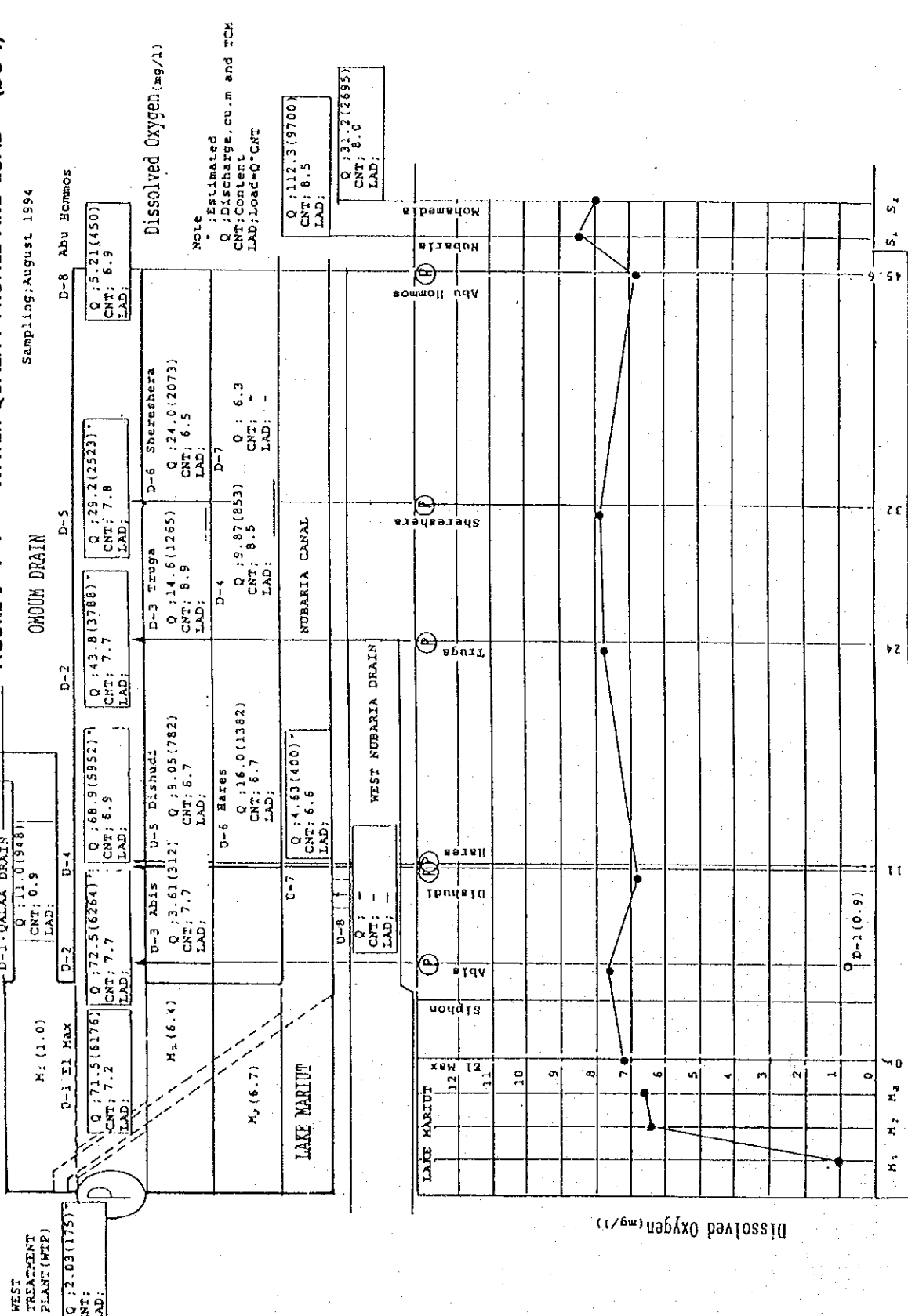


FIGURE J-1-9 WATER QUALITY PROFILE AND LOAD (BDO-1)

Sampling: August 1994

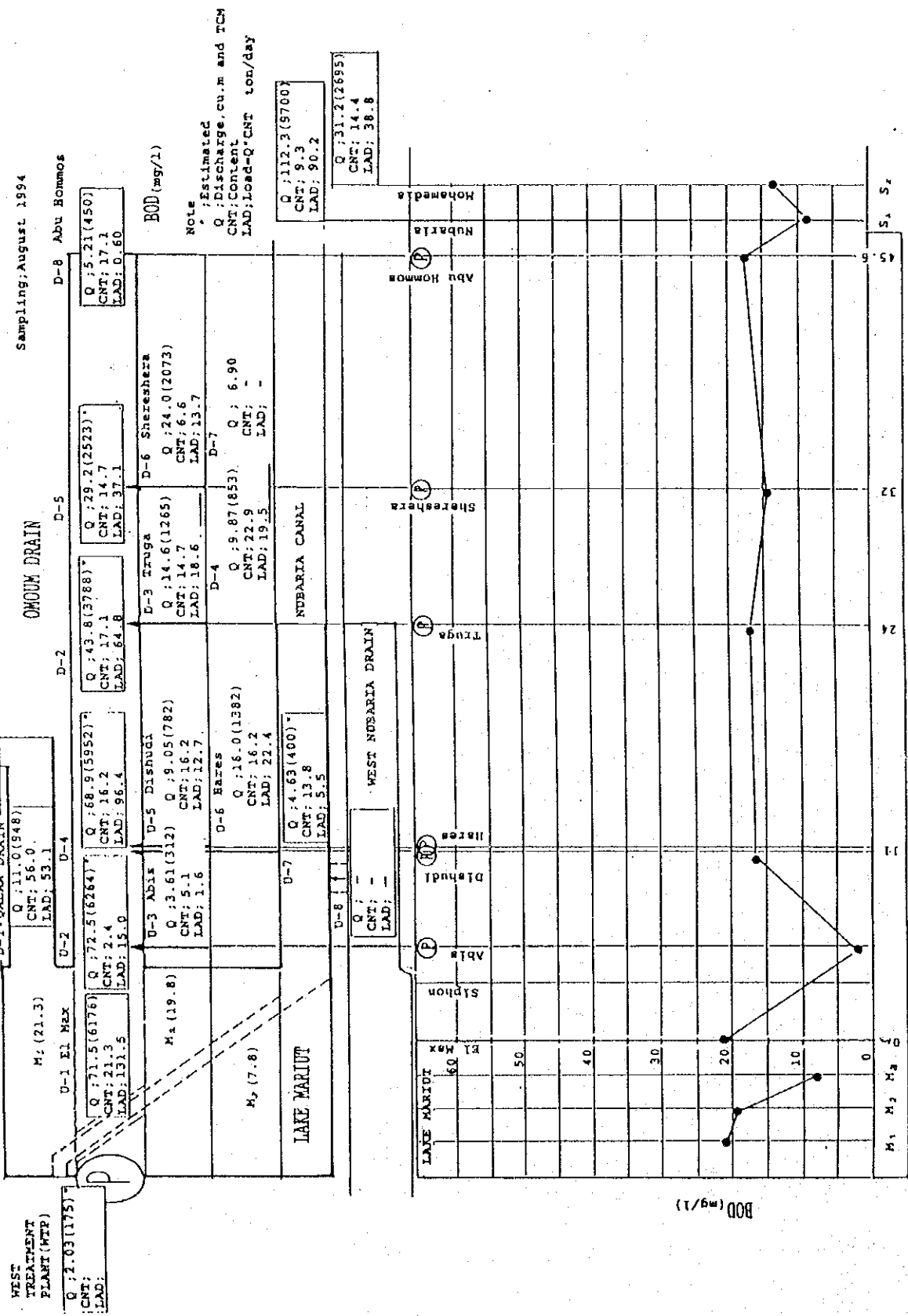


FIGURE J-1-10 WATER QUALITY PROFILE AND LOAD (BOD-2)

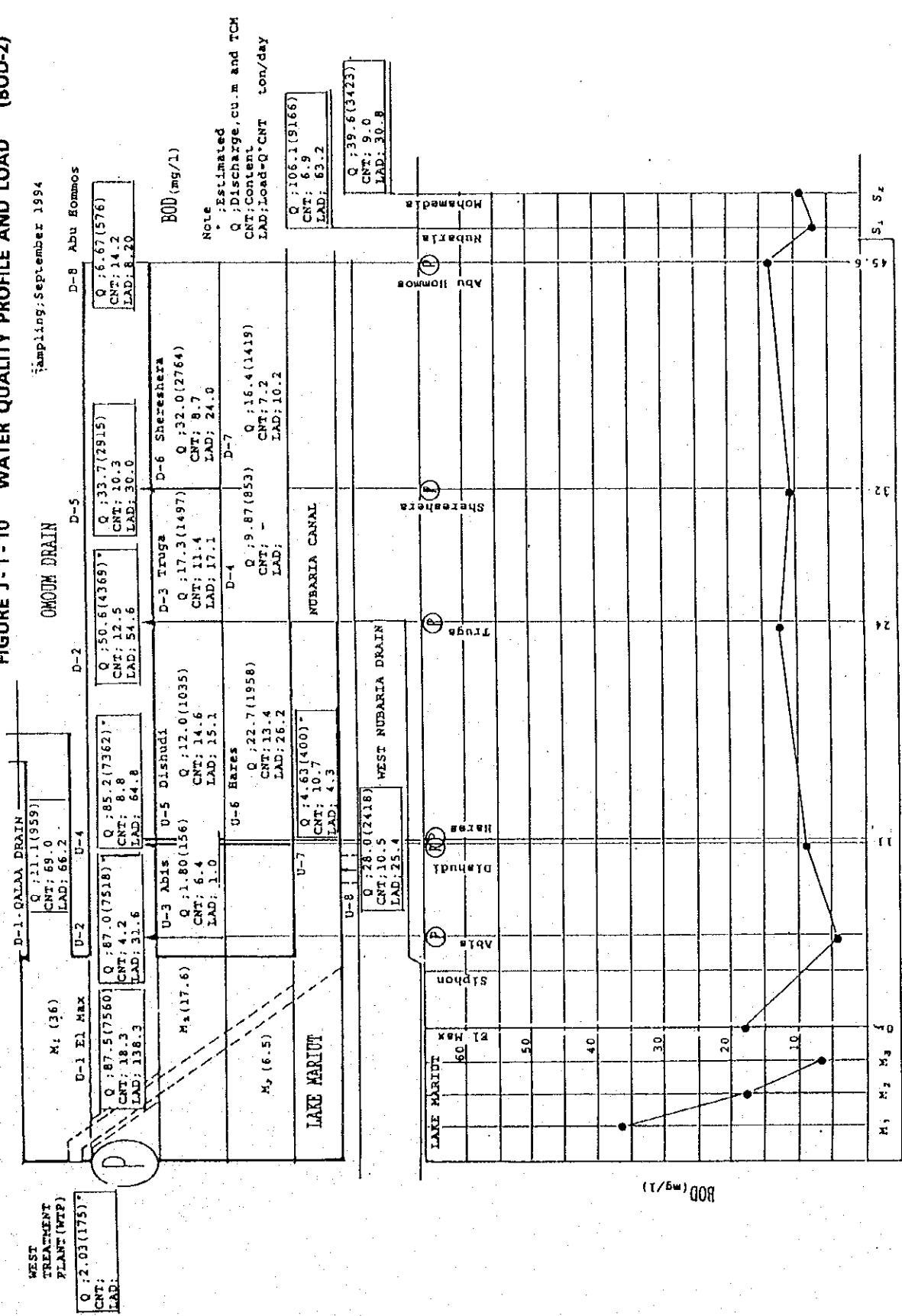


FIGURE J-1-11 WATER QUALITY PROFILE AND LOAD (COD-1)

Sampling: August 1994

OMQUM DRAIN

WEST TREATMENT PLANT (WTP)

Q: 2.03 (175)
CNT: 449.4
LAD: 78.6

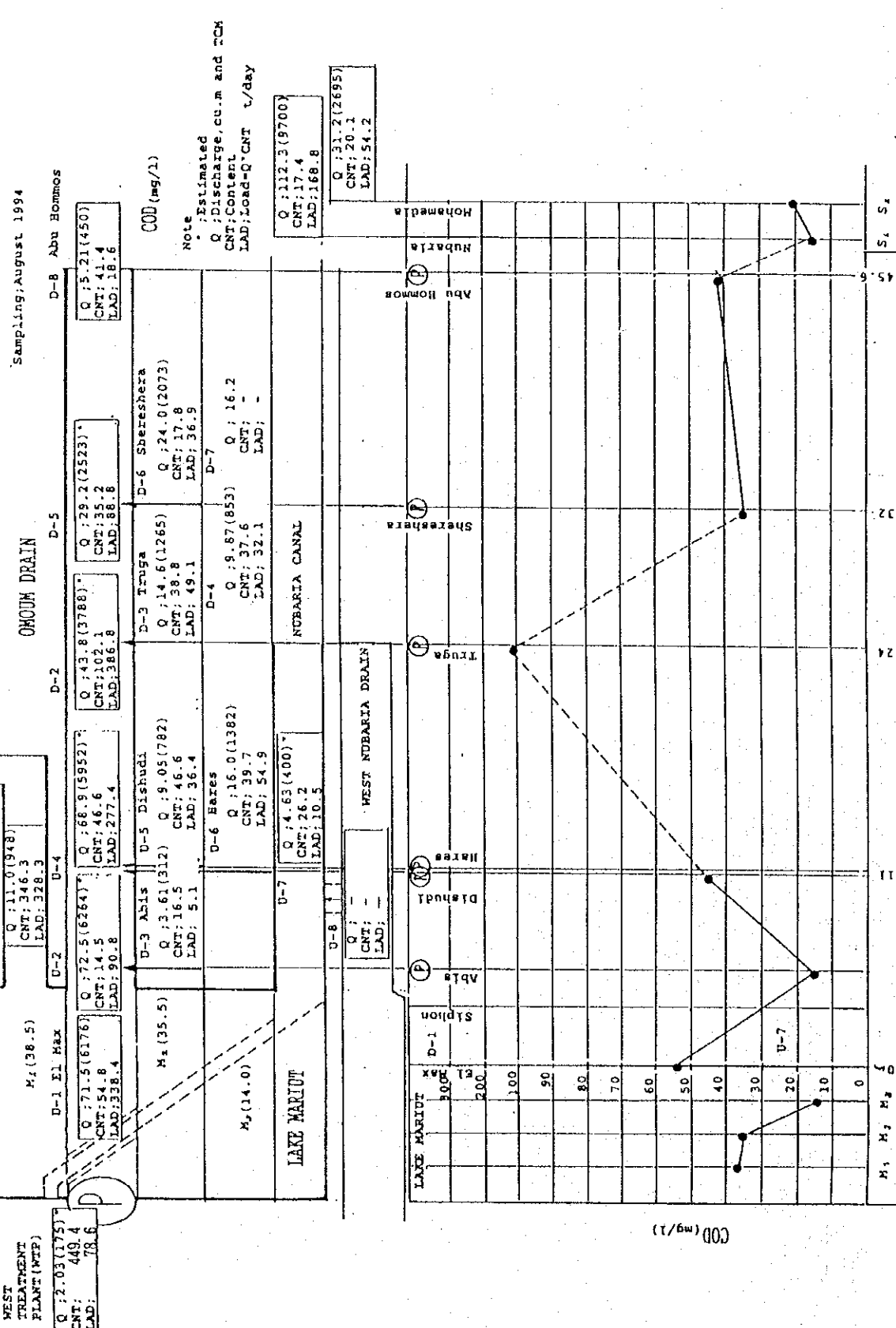


FIGURE J-1-13 WATER QUALITY PROFILE AND LOAD (COLIFORM-1)

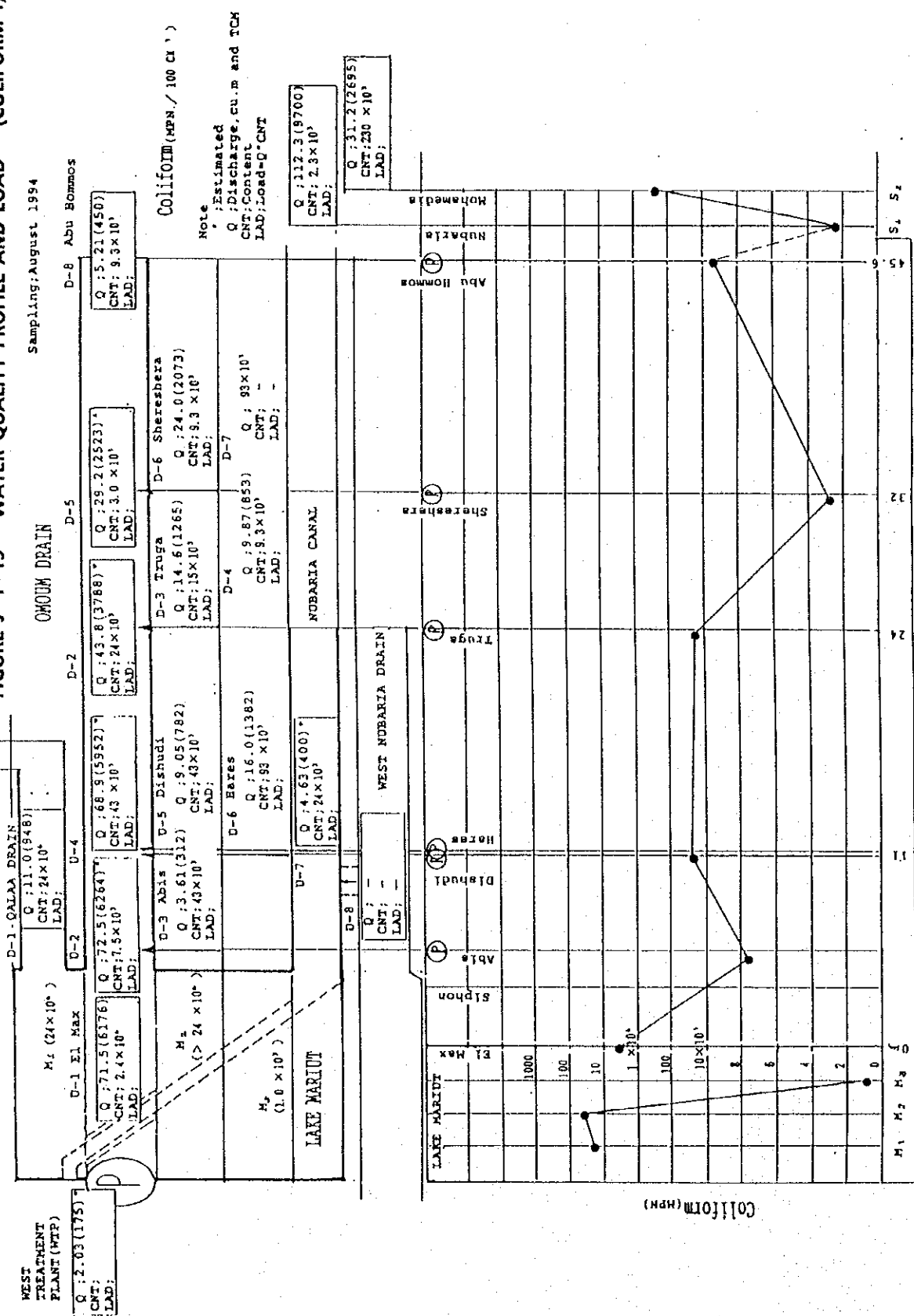


FIGURE J-1-14 WATER QUALITY PROFILE AND LOAD (COLIFORM-2)

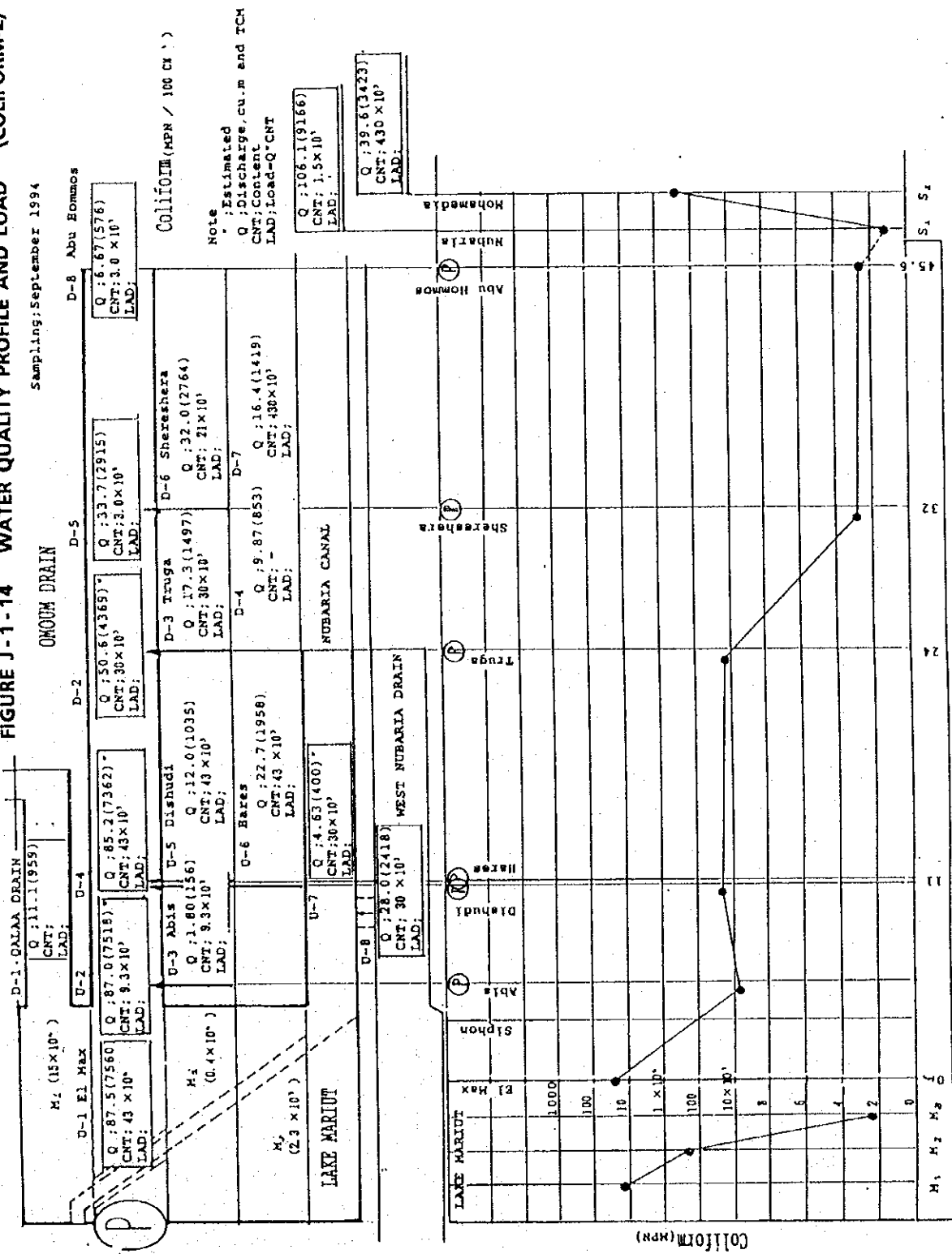


FIGURE J-1-15 WATER QUALITY PROFILE AND LOAD (TSS-1)

Sampling: August 1994

OMGOM DRAIN

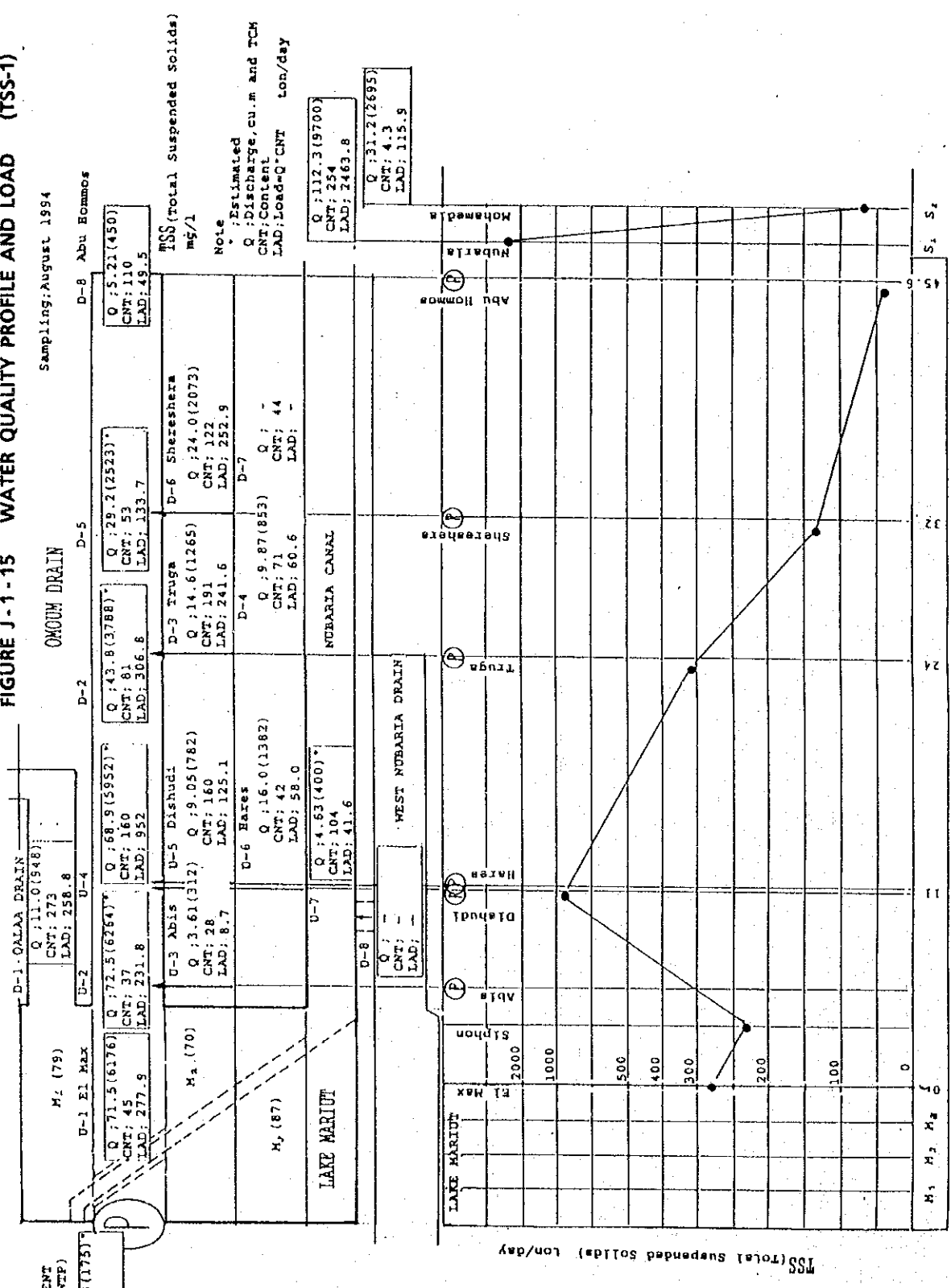


FIGURE J-1-16 WATER QUALITY PROFILE AND LOAD (TSS-2)

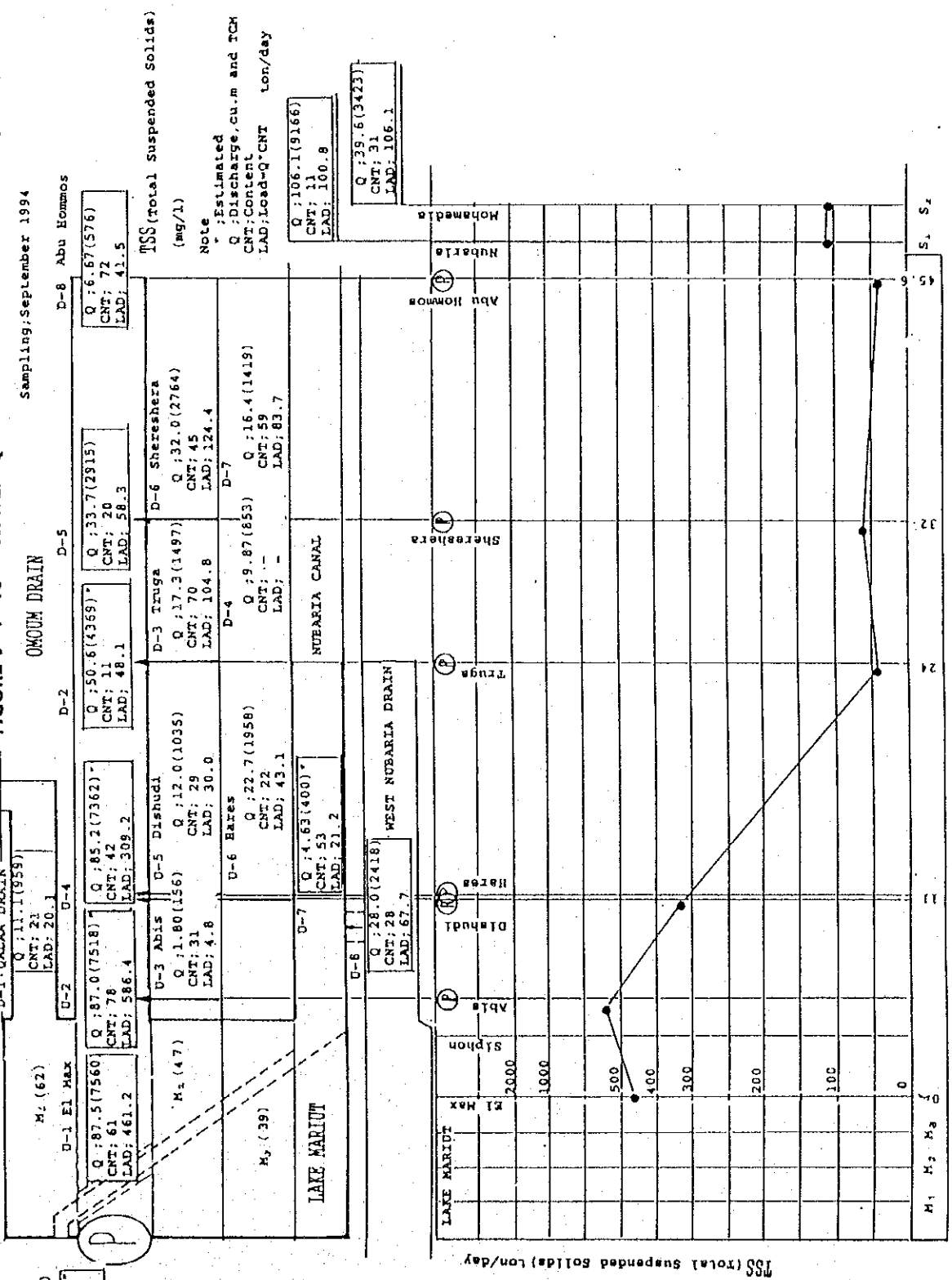


FIGURE J-1-17 WATER QUALITY PROFILE AND LOAD (T-N, T-P1)

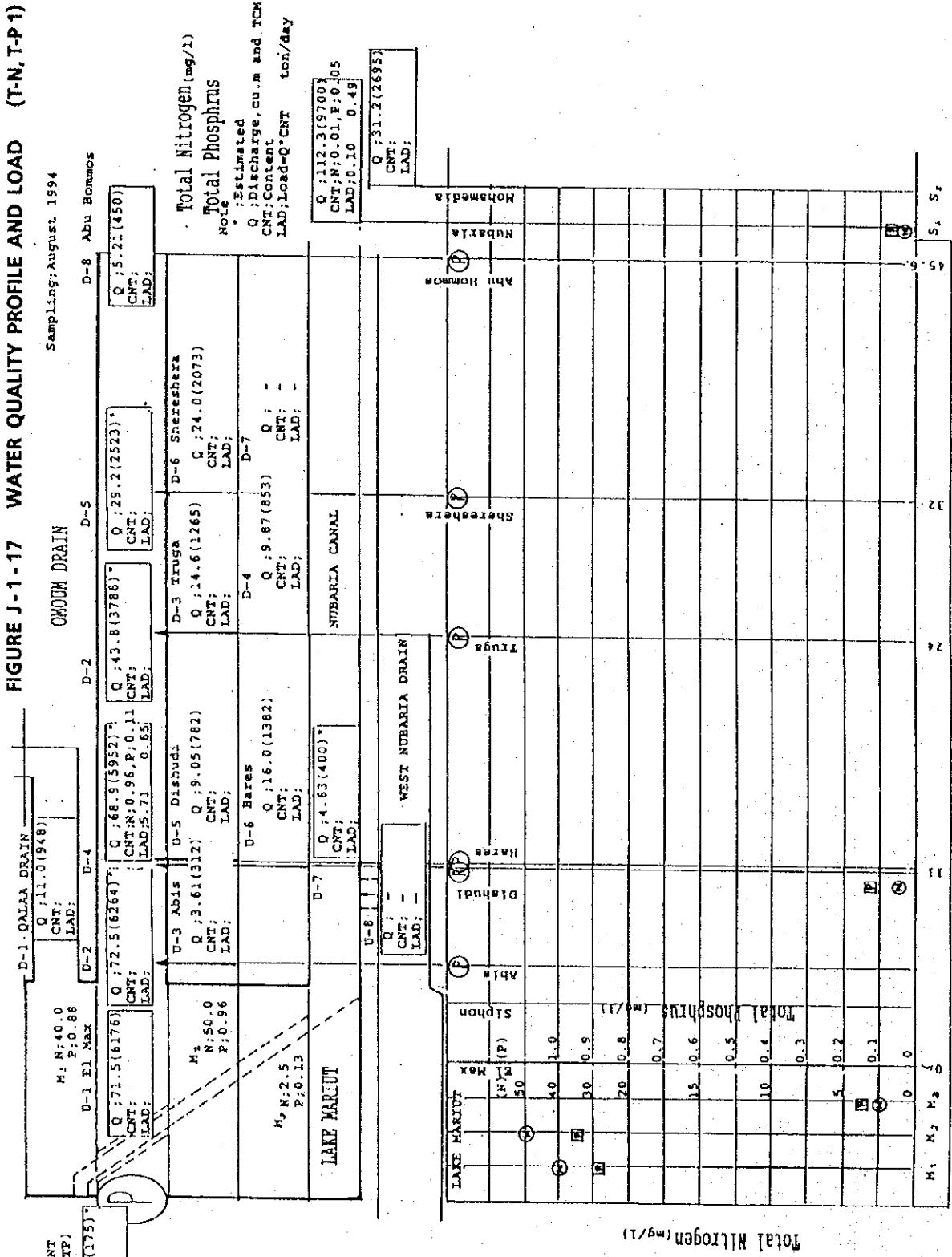


FIGURE J-1-18 WATER QUALITY PROFILE AND LOAD (T-N, T-P 2)

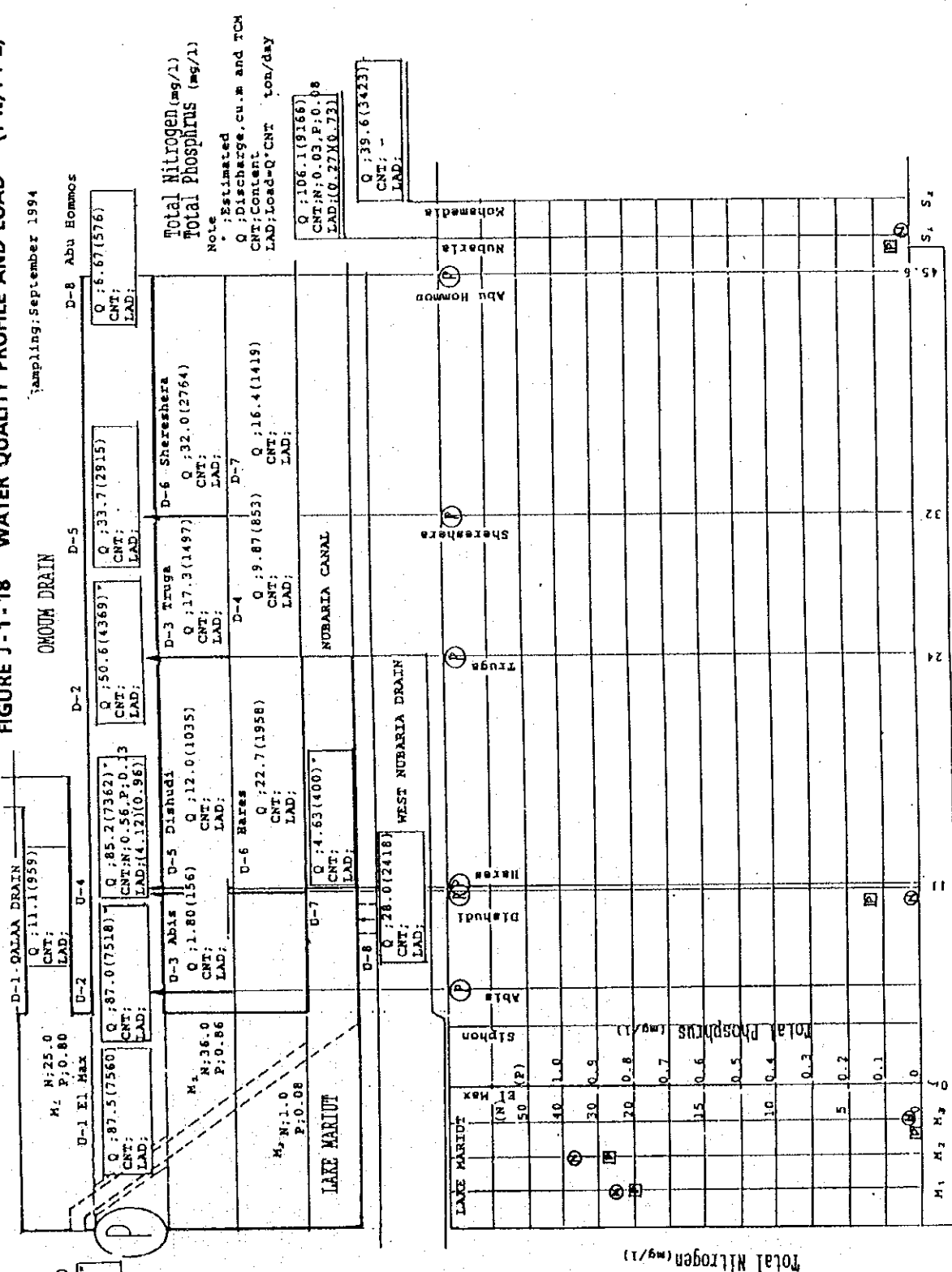
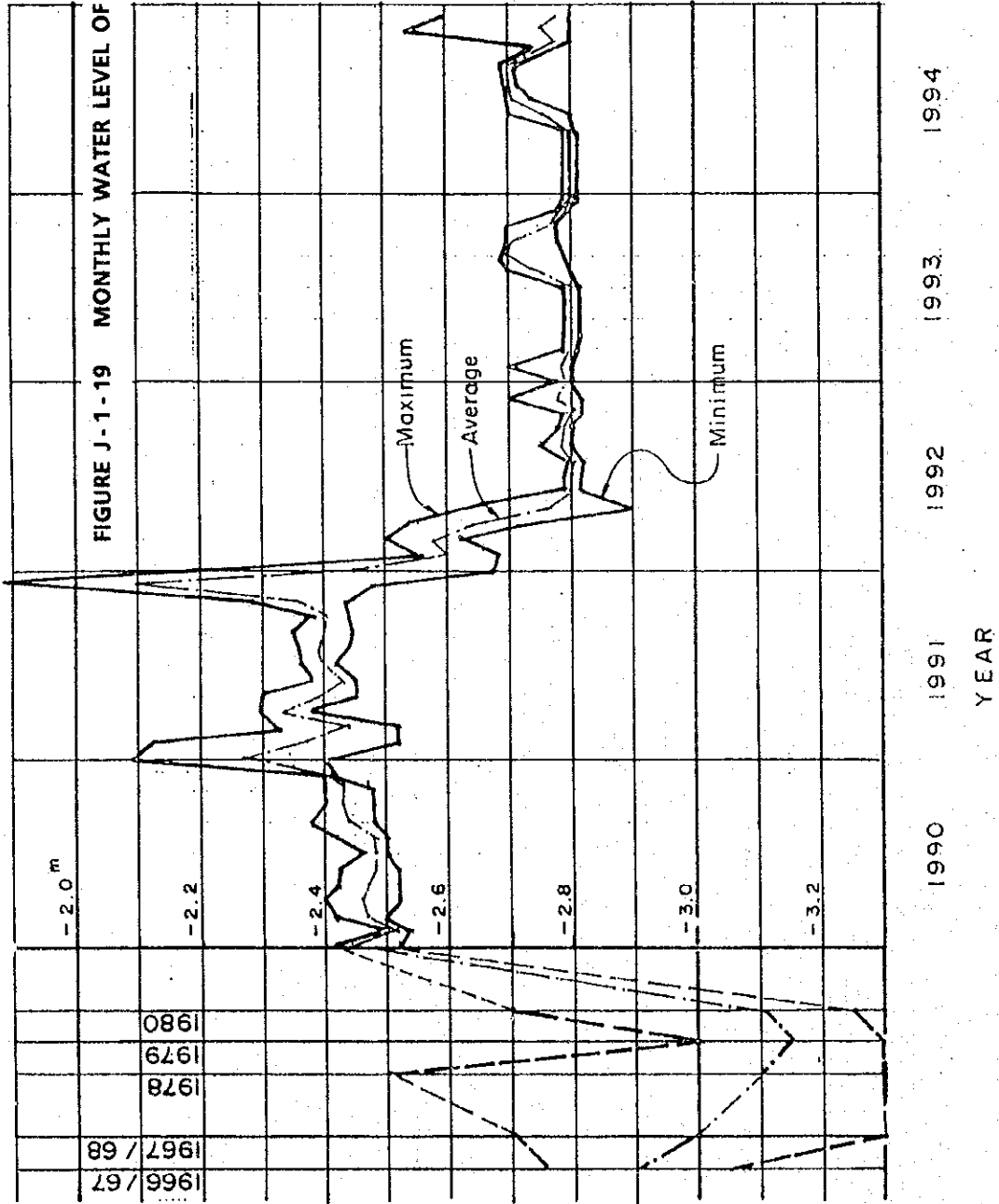


FIGURE J-1-19 MONTHLY WATER LEVEL OF MARIUT LAKE



No.

YEAR 1990-1994
年

FIGURE J-1-1-20 WATER LEVEL OF LAKE MARIUT
河川 水系

STATION EL MAX
観測所

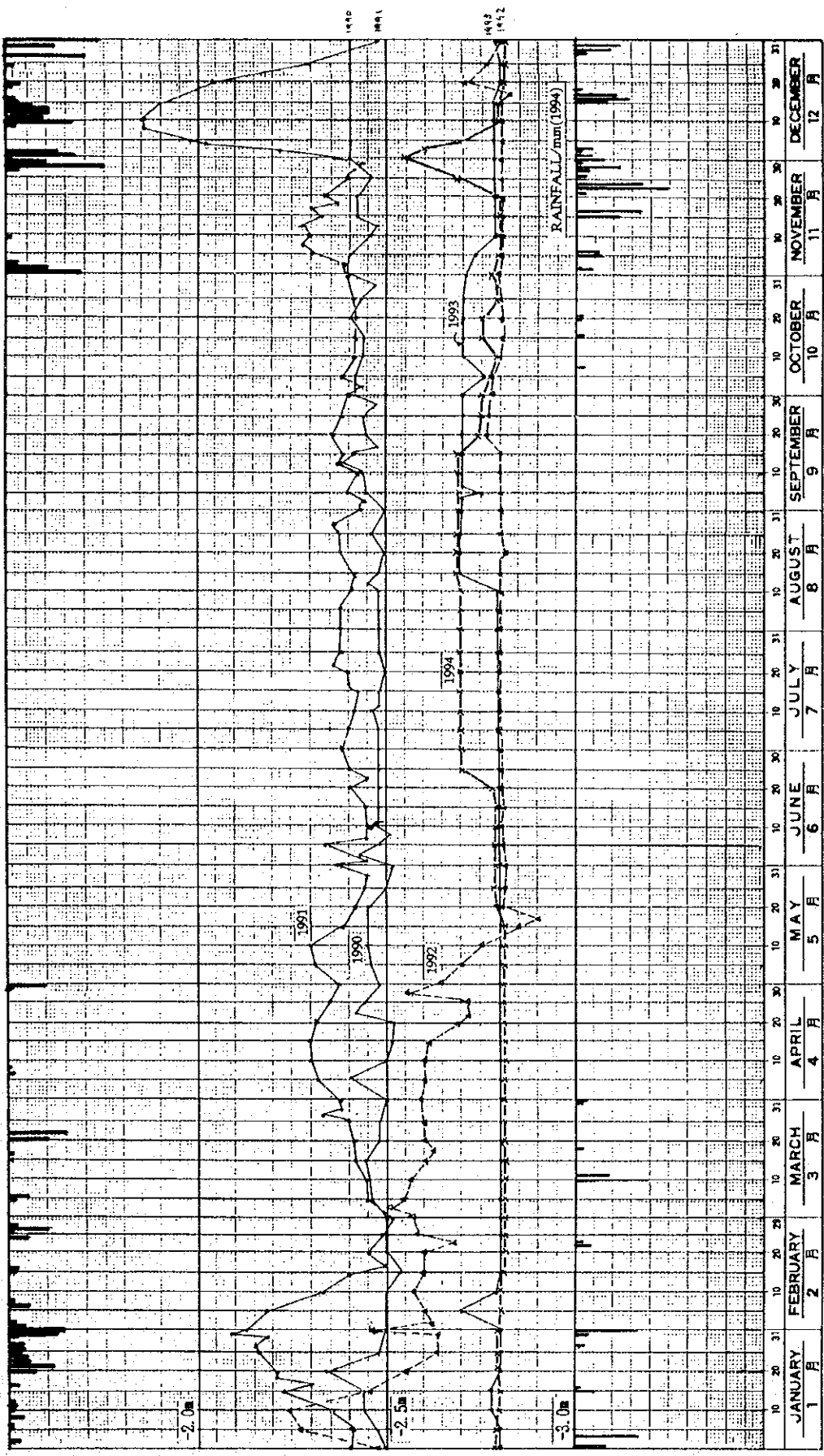


FIGURE J-1-21 HYDROGRAPH OF NUBARIYA CANAL (1)

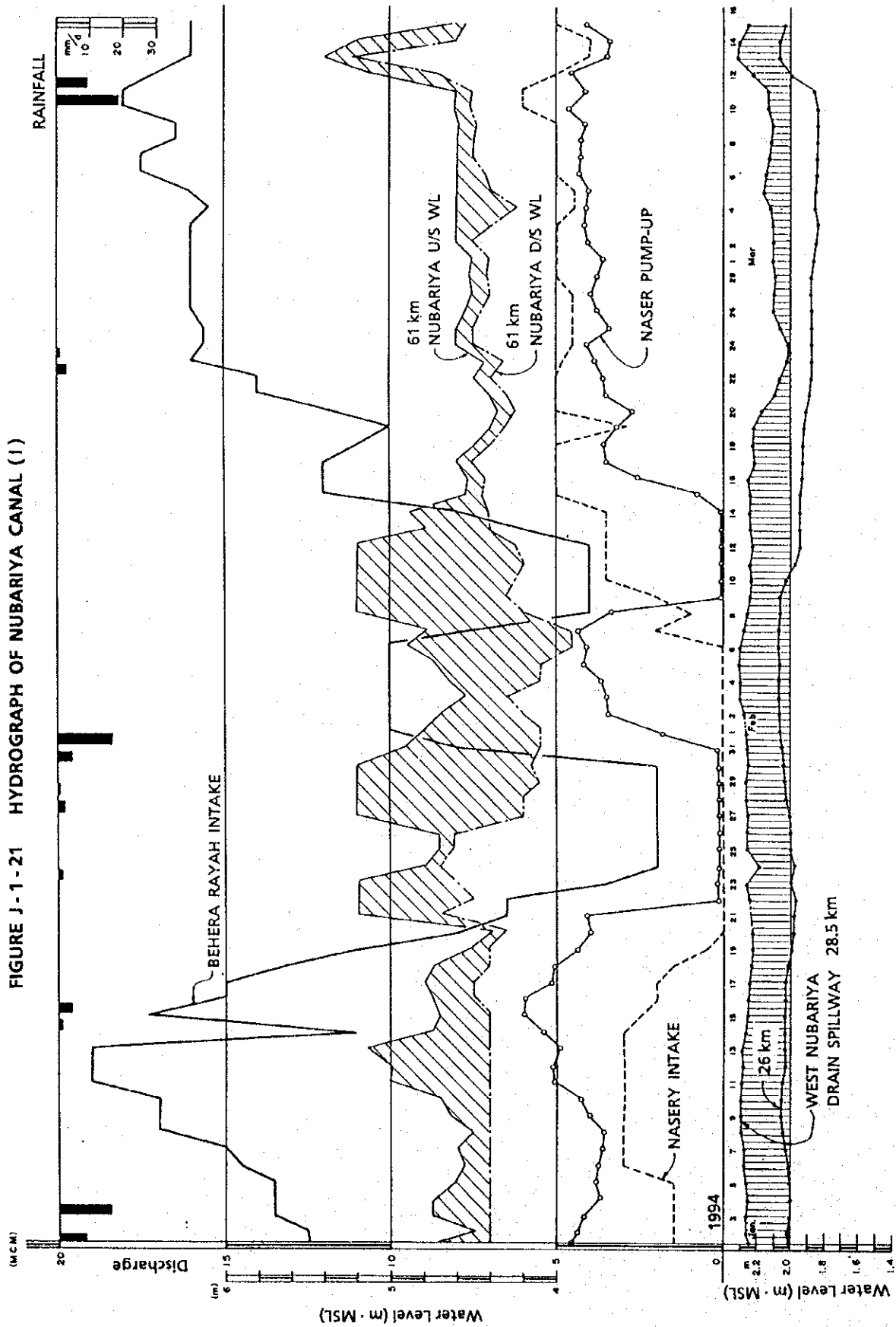
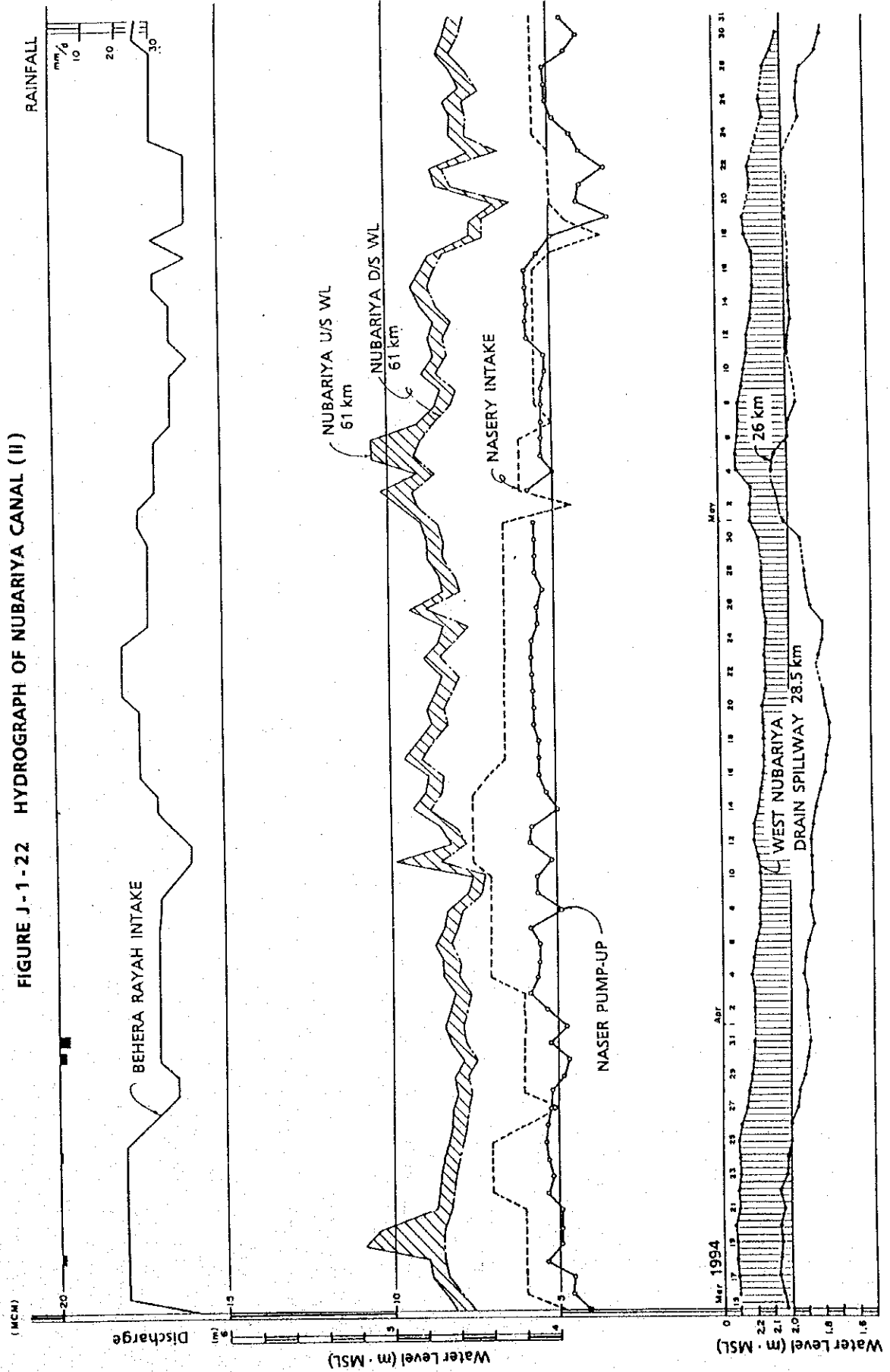
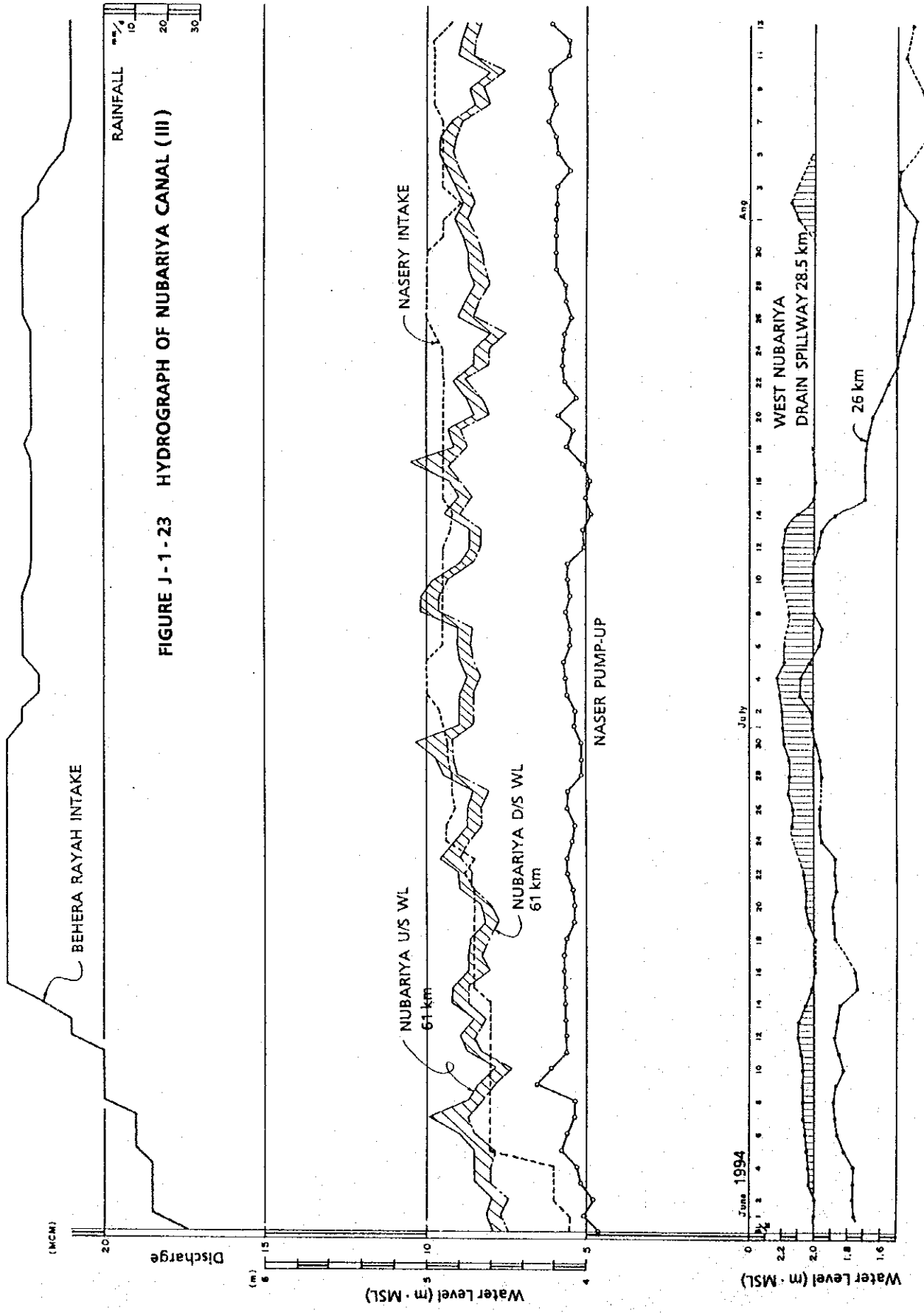


FIGURE J-1-22 HYDROGRAPH OF NUBARIYA CANAL (II)





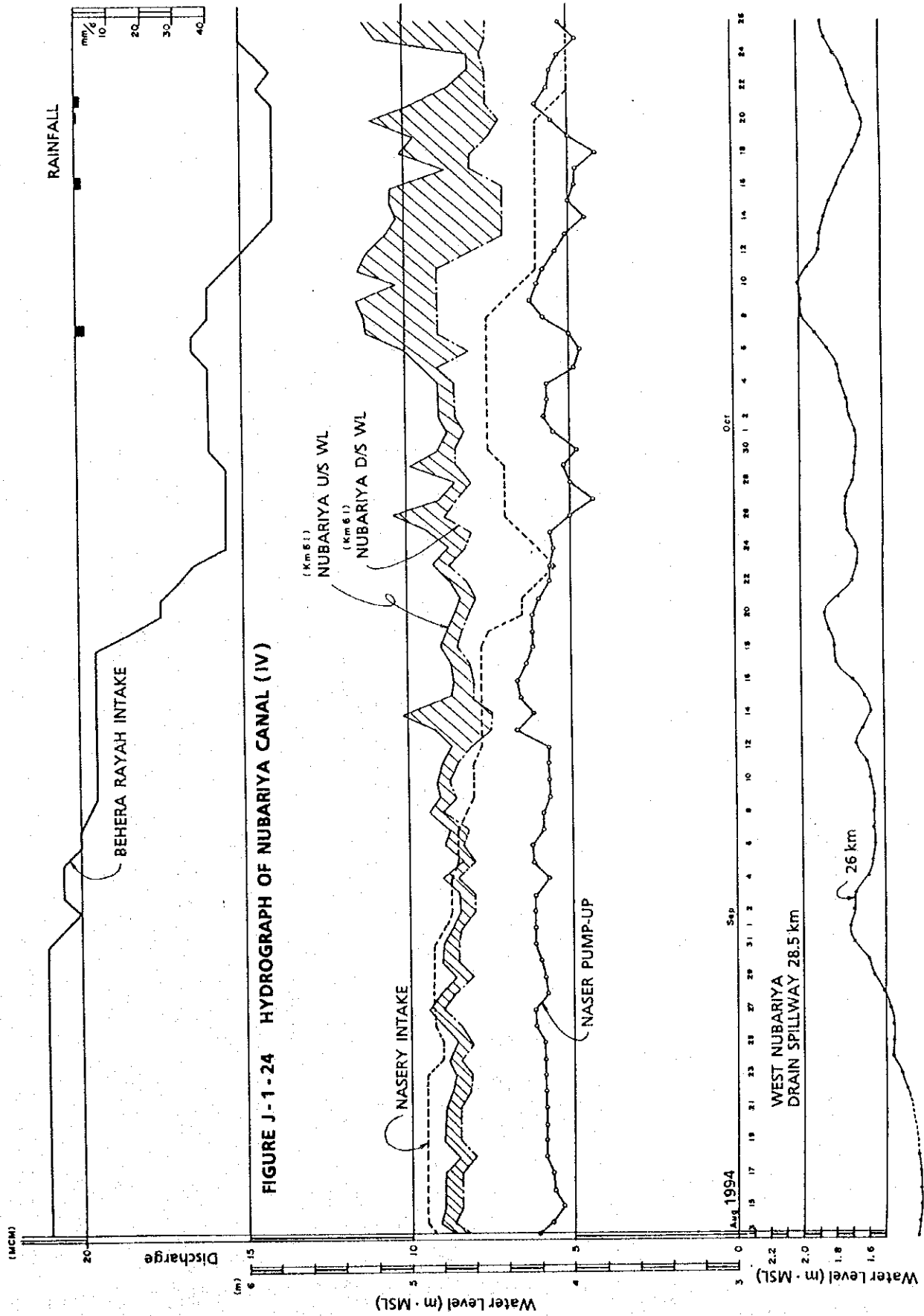
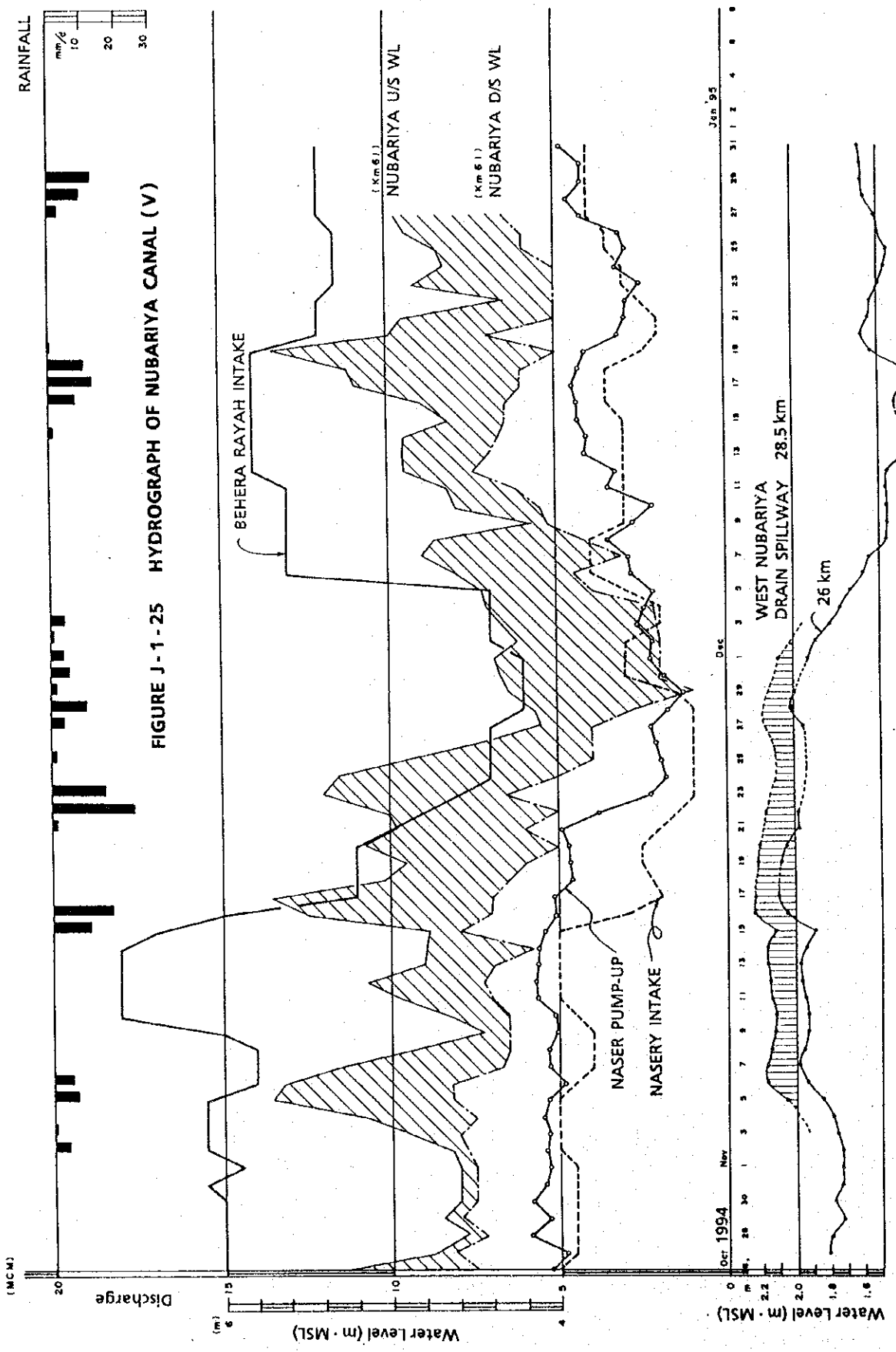


FIGURE J-1-24 HYDROGRAPH OF NUBARIYA CANAL (IV)



ANNEX J-1-A WATER QUALITY SURVEY IN OMOUM AREA (SEP. 1994)

WATER QUALITY SURVEY

IN

OMOUM DRAIN AREA

Cairo

September, 1994

1. INTRODUCTION

This report is submitted according to the agreement signed in August, 1994 between the study team of Japan International Cooperation Agency (JICA), hereinafter called the Employer and the Surveyor concerning the water quality survey for the Feasibility Study on Farmland Environmental Improvement Project in Omoum Area.

This report includes description of the study area and details of the activities carried out in August and September 1994. The results of in-situ and laboratory measurements are also included.

2. DESCRIPTION OF THE STUDY AREA

This study area specified by the Employer covers the Omoum watershed area and Lake Mariut. The Omoum watershed area in the Western Delta is presented in Figure-1. The Omoum drain system is one of the main drain systems in the Western Delta. It is situated between the Edko drain system and the Nubariya canal near the western Desert. A schematic diagram of the Omoum drainage system is presented in Figure-2. It consists of one reuse and seven drainage pumping stations as follows:

- Shereshera PS	(WU-2)
- Truga PS	(WU-3)
- Dishudi PS	(WU-5)
- Hares PS	(WU-6)
- Abies PS	(WU-7)
- Qalaa PS	(WU-8)
- Max PS	(WU-9)
- Mariut No.1	(WU-10) reuse pump station

The codes given between brackets at the above pump stations are those used for the regular program of monitoring the drainage water quantity and quality in the Western delta.

The Abu Hommes catchment area of 46,000 feddan (MOI, 1981) is drained by gravity to the Omoum drain.

The Shereshera PS (WU-2) pumps the drainage water of the Shereshera catchment of 150,000 feddan into the Omoum drain. About 5.5 km downstream of Shereshera PS, an area of 430 feddan is irrigated with drainage water from the Omoum drain.

Truga PS (WU-3) pumps the drainage water from its catchment area of 103,000 feddan (MOI, 1981) into Omoum drain. About 2 km downstream of Truga PS, a canal connects the Omoum drain with Mariut No.1 PS (WU-10). Since 1982, this pump station became in operation and pumps drainage water into Nubariya canal. The reuse pumping station Mariut No.1 (WU-10) pumps its water from the Omoum drain downstream the Shereshera PS (WU-2) and Truga PS (WU-3) into the Nubariya canal. More downstream, the pumping stations Dishudi (WU-5), Hares (WU-6) and Abies (WU-7) discharge into the Omoum drain, which flows freely to Lake Mariut. Reuse of drainage water from Omoum drain in the catchment area of Hares PS is common for leaching of saline soils. Also at the Anwar Bridge, reuse of Omoum water takes place through 2 pipes with diameter of 1.20 m. The drainage water flows by gravity into a canal feeding the tail-end of the El Hager canal.

In Dishudi catchment Area, reuse of drainage water from the Omoum drain takes place. Dishudi PS pumps the drainage water of its catchment area of 33,000 feddan into the Omoum drain.

The discharge of the Hares PS is distributed over the Omoum drain itself and another drain parallel to the Omoum drain. This parallel drain also flows to Mariut Lake. The total area drained by hares PS is 62,000 feddan.

Abies PS (also referred to as Mariut) is located at a distance of about 3 km from the outfall of Omoum drain into Mariut lake. The pumped drainage water of this pumping station flows partly to the Omoum drain and partly to a drain parallel to the Omoum drain. The total area drained by Abies PS is 8,000 feddan.

The Qalaa PS (WU-8) pumps drainage water from its catchment area of 14,000 feddan and part of the sewage water of the city Alexandria. The drainage water of Qalaa PS flows to Lake Mariut. Because the level of Lake

Mariut is about 2 m below mean sea level, the drainage water from Lake Mariut is pumped by Max PS (WU-9) into the Mediterranean Sea.

The drainage water from the Nubariya Area (280,000 feddan) is diverted directly to the Mediterranean Sea. The surplus of drainage water diverts to Mariut Lake through a side spillway. Also water spilled at the Shiplocks in the Nubariya canal is discharged into Mariut Lake.

The water in Mariut Lake is lifted by Max PS and discharged into the Mediterranean Sea. The low level in Mariut Lake and the permeable subsoil cause considerable seepage from the Mediterranean Sea and the elevated Nubariya Area into Mariut Lake.

Lake Mariut is composed of three separate basins:

- The main basin of about 6,000 feddans;
- The south western basin of about 7,000 feddans;
- The north western basin of about 3,000 feddans.

The boundaries of these basins are Cairo-Alex Desert Road, Omoum drain, Nubariya canal and Alex-Matrouh Railroad. The cross sections of Omoum drain and Nubariya canal inside the lake are not clearly defined. they cross in marshes before the drain reaches its end at Max PS and the canal reaches its end at the Mediterranean Sea.

Several sources of domestic and industrial wastewater are disposed to the three basins either directly to the lake or indirectly through the drains or through desludging by tractors to the lake.

FIGURE -1 THE OMOUM WATERSHED AREA

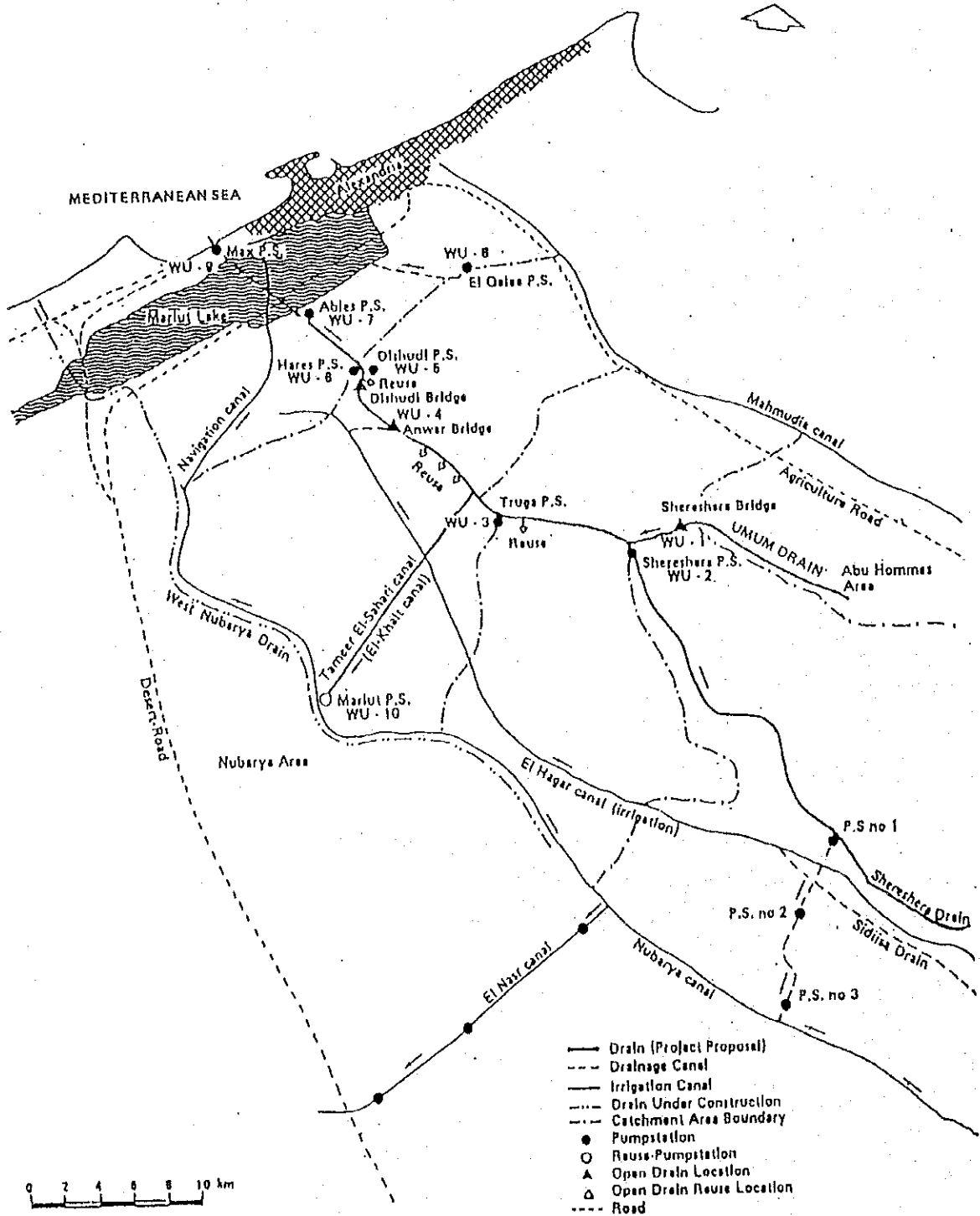
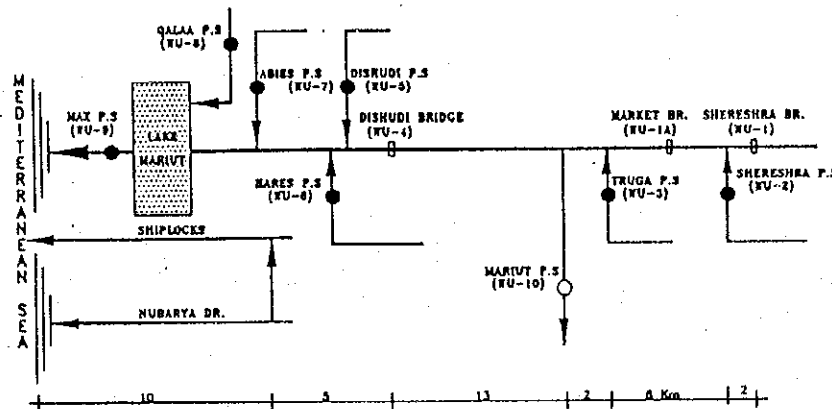


FIGURE -2 SCHEMATIC DIAGRAM OF THE OMOUM DRAINAGE SYSTEM



3. ACTIVITIES CARRIED OUT DURING THE REPORTING PERIOD

3.1 Reconnaissance Visits to the Study Area

At the beginning of August, two-days visit has been made to Omoum area to identify the exact locations of the twenty (20) sites specified by the Employer. The Surveyor team was accompanied by representatives from JICA consulting team. Also, on August 11th, a one-day visit has been made to Lake Mariut.

Accordingly, the sampling sites were identified and classified into four groups:

- 1) Lake Mariut
 - * Center of main basin (6,000 feddans) (M-1)
 - * Center of SW basin (7,000 feddans) (M-2)
 - * Center of NW basins (3,000 feddans) (M-3)

- 2) Omoum Drain
 - * Max PS (U-1)
 - * Omoum drain at desert road (U-2)
 - * Abis PS (U-3)
 - * Omoum drain after mixing with Dishudi (U-4)
 - * Dishudi PS (U-5)

- * Hares PS (U-6)
 - * Shiplock (U-7)
 - * Nubariya drain (U-8)
- 3) Branch drains and pumping stations
- * Qalaa PS (D-1)
 - * Omoum drain after mixing with Truga (D-2)
 - * Truga PS (D-3)
 - * El Abd drain (D-4)
 - * Omoum dr. after mixing with Shereshera (D-5)
 - * Shereshera PS (D-6)
 - * Shereshera drain (D-7)
 - * Abu Hommos PS (D-8)
- 4) Irrigation Canals
- * Nubariya canal (S-1)
 - * Khandak El Sharki canal at Damanhur (S-2)

The sampling sites are shown in Figure-3.

FIGURE -3 LOCATIONS OF WATER SAMPLING SITES

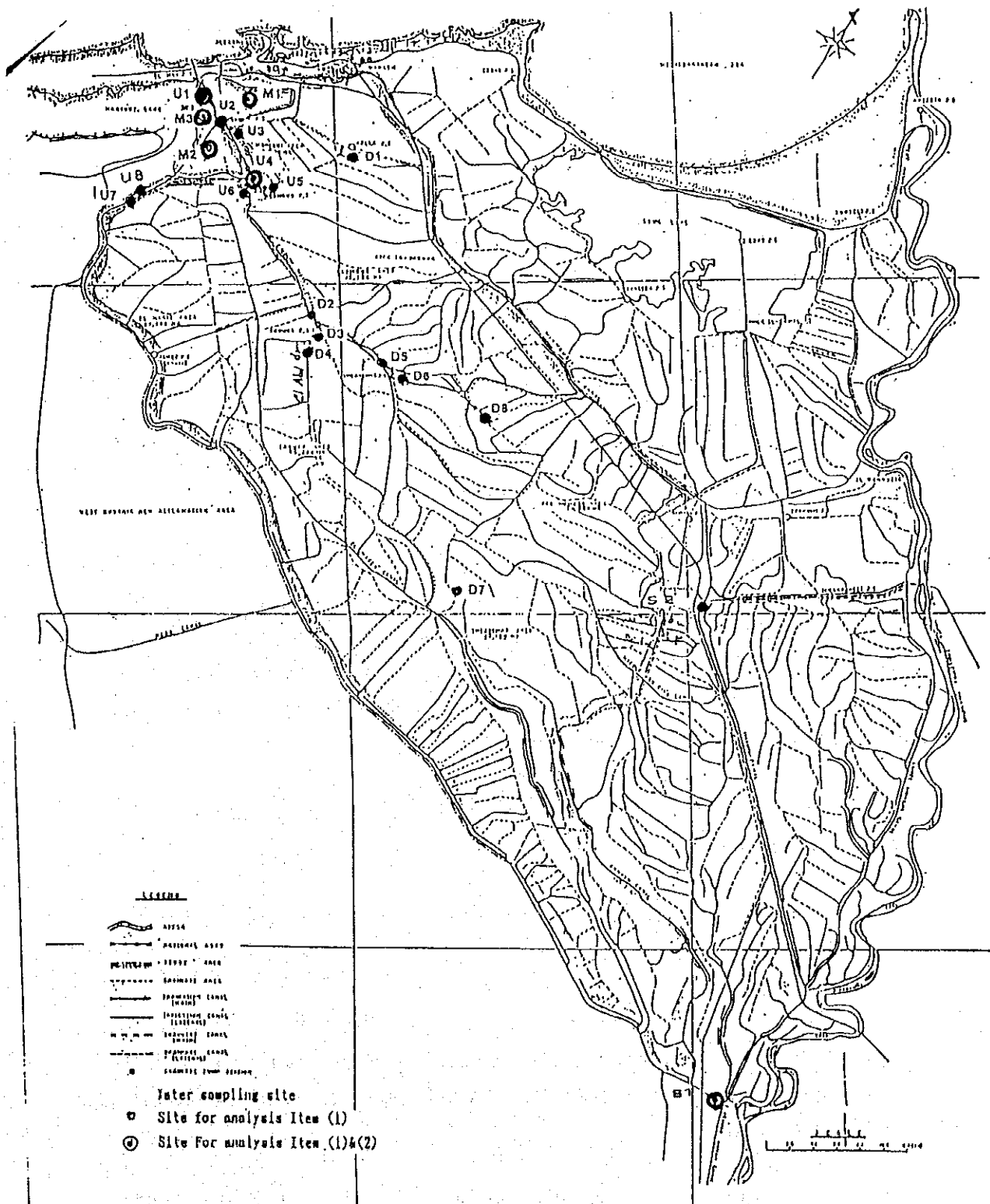


Figure 3. Locations of water sampling sites

3.2 Field Measurements

Field measurements were carried out during August and September, 1994. They included the followings as specified by the Employer:

- discharge
- smelling
- turbidity
- water color
- air and water temperature
- Electrical Conductivity (EC)
- Dissolved Oxygen (DO)
- Hydrogen Ion Activity (pH)
- Total coliform and total Bacillus

1) Discharge Measurements

The discharge measurements at open locations along a canal or drain are normally performed using the velocity - area method where the rate of flow is determined by multiplying the cross sectional area (perpendicular to the direction of flow) by the velocity of water. The cross sectional area is determined by direct measurements and the velocity is measured by a current meter from a bridge as shown in Figure-4.

The discharge measurements in August were conducted by the Surveyor at two locations, namely U-2 and D-4. the results are:

$$\begin{array}{ll} Q = 39.47 \text{ m}^3/\text{s} (3,411 \times 10^3 \text{ m}^3/\text{day}) & \text{at location (U-2)} \\ Q = 9.87 \text{ m}^3/\text{s} (853 \times 10^3 \text{ m}^3/\text{day}) & \text{at location (D-4)} \end{array}$$

Upon the request of the Employer in September, El Abd drain sampling site (D-4) was omitted and replaced by Nubariya drain site (U-8). Four discharge measurements were taken in September at U-2, U-8, U-5 and D-7. The results are:

$$\begin{array}{ll} Q = 53.88 \text{ m}^3/\text{s} (4,656 \times 10^3 \text{ m}^3/\text{day}) & \text{at location (U-2)} \\ Q = 27.99 \text{ m}^3/\text{s} (2,418 \times 10^3 \text{ m}^3/\text{day}) & \text{at location (U-8)} \\ Q = 33.74 \text{ m}^3/\text{s} (2,916 \times 10^3 \text{ m}^3/\text{day}) & \text{at location (U-5)} \end{array}$$

$Q = 16.42 \text{ m}^3/\text{s} (1,418 \times 10^3 \text{ m}^3/\text{day})$ at location (U-7)

Estimates were made at two sites, namely U-4 and D-2.

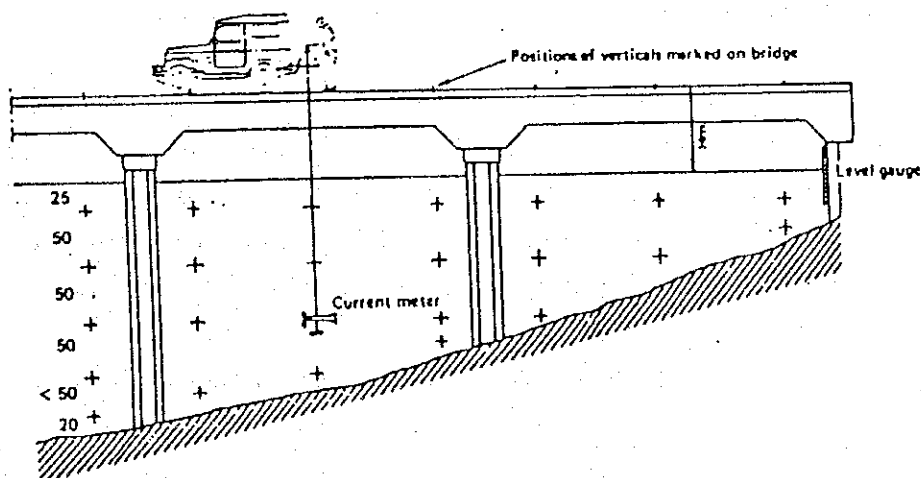
* The approximate discharge value of U-4 is equal to the discharge at U-2 minus the discharge of Abis PS (U-3)

Then $Q = 52.08 \text{ m}^3/\text{s} (4,500 \times 10^3 \text{ m}^3/\text{day})$ at location (U-4)

* The approximate discharge value of D-2 is equal to the discharge at D-5 plus the discharge of Truga PS (D-3) minus an approximate quantity of unofficial reuse of $0.5 \text{ m}^3/\text{sec}$.

Then $Q = 49.87 \text{ m}^3/\text{s} (4,309 \times 10^3 \text{ m}^3/\text{day})$ at location (D-2)

FIGURE - 4 DISCHARGE MEASUREMENTS FROM BRIDGE



At the other sites, daily discharge values were collected during the two trips from the records of the Pump Stations and the Irrigation Sector both are under the Ministry of Public Works and Water Resources. Table-1 presents the daily discharges during the two field trips made in August and September, 1994.

TABLE 1. DAILY DISCHARGE AT THE SAMPLING SITES DURING AUGUST AND SEPTEMBER, 1994 (1,000 m³/day)

	Trip Day	Max PS U-1	Abis PS U-3	Dishodi PS U-5	Haris PS U-6	Qalla PS D-1	Truga PS D-3	Shrisha PS D-6	Abo Homo PS D-5	Khandak Sharki S-2	Mahmodi Canal	Nubariya Intake S-1
Aug.	First	6176	312	900	1325	898	1611	1900	432	2755	9845	9970
	Second	6176	312	782	1382	948	1410	2073	450	2630	9952	9650
	Third	6176	312	878	1469	949	1286	2073	450	2895	9887	9700
Aug.	First	7560	156	1034	2074	999	1496	2764	558	3423	8073	10248
	Second	7560	312	1038	1988	959	1640	2764	576	3423	8063	9166
	Third	7560	416	1028	1786	949	1497	2764	376	3423	8002	9166

Shading block indicates the discharge value during the sampling date.

2) Other In-situ Measurements

According to the contract, some water quality in-situ measurements were performed at the twenty locations. In-situ measurements have been conducted using EC meter, pH meter and water quality checker (HORIBA MODEL U-7). the results are shown in Tables 2a to 2d. In addition, total coliform and total bacillus have been determined for the collected samples during September.

Table (2a) Water Quality Field Measurements for Lake Mariut

Site	Month	EC mmhos/cm	pH	DO mg/l	TURB NTU	Temp.(C)		* Color	* Smell	Coliform MPN	Bacillus MPN
						Water	Air				
M1	Aug.	3.93	8.0	1.1	44	28.1	30.3	2	2		
M1	Sept.	3.60	7.6	3.4	36	27.4	29.7	3	3	36*10 ⁵	21*10 ⁵
M2	Aug.	6.56	7.5	2.3	52	27.9	30.5	2	2		
M2	Sept.	8.10	7.7	5.4	20	27.2	29.8	1	1	13*10 ⁵	11*10 ⁵
M3	Aug.	13.49	8.0	3.7	48	29.5	34.7	2	2		
M3	Sept.	12.75	8.0	6.7	34	28.8	31.5	2	2	1*10 ³	3*10 ²

Table (2b) Water Quality Field Measurements for Omoum Drain

Site	Month	EC mmhos/cm	pH	DO mg/l	TURB NTU	Temp.(C)		*	*	Coliform MPN	Bacillus MPN
						Water	Air				
U1	Aug.	9.49	7.8	5.8	29	27.4	33.1	2	2		
U1	Sept.	7.80	7.6	6.3	30	26.8	29.3	2	2	53*10 ⁴	6*10 ⁴
U2	Aug.	6.82	7.8	6.9	37	27.4	28.5	1	1		
U2	Sept.	4.57	7.4	6.6	22	26.9	27.5	1	1	53*10 ²	
U3	Aug.	8.82	7.4	6.5	29	26.6	29.9	1	1		
U3	Sept.	9.12	7.5	6.5	18	27.1	28.5	1	1	4*10 ³	
U4	Aug.	4.75	7.7	4.5	40	27.4	30.8	1	1		
U4	Sept.	4.30	7.7	6.5	22	28.7	31.6	1	1	8*10 ³	1*10 ²
U5	Aug.	6.80	7.5	5.1	39	26.3	30.1	1	1		
U5	Sept.	5.03	7.6	6.5	24	28.8	30.2	1	1	9*10 ³	6*10 ³
U6	Aug.	13.20	7.7	4.3	29	26.3	30.9	1	1		
U6	Sept.	11.40	7.7	6.5	20	29.3	31.4	1	1	23*10 ³	3*10 ³
U7	Aug.	6.58	9.1	6.2	31	27.7	32.1	3	3		
U7	Sept.	2.40	8.6	6.1	24	27.5	28.6	1	1	11*10 ³	3*10 ³
U8	Sept.	5.80	8.1	6.5	30	26.6	28.2	2	1	70*10 ³	3*10 ³

Table (2c) Water Quality Field Measurements for Branch Drains

Site	Month	EC mmhos/cm	pH	DO mg/l	TURB NTU	Temp.(C)		*	*	Coliform MPN	Bacillus MPN
						Water	Air				
D1	Aug.	2.65	7.4	0.0	100	27.9	29.8	4	4		
D1	Sept.	2.70	7.4	0.5	88	27.8	29.8	4	4	31*10 ⁵	-
D2	Aug.	3.15	7.6	5.3	37	27.3	31.8	1	1		
D2	Sept.	2.40	7.9	6.4	25	28.1	30.6	1	1	15*10 ³	11*10 ³
D3	Aug.	5.90	7.3	6.1	31	26.4	31.6	1	1		
D3	Sept.	3.60	7.9	6.4	24	27.4	30.1	1	1	4*10 ³	33*10 ²
D4	Aug.	5.16	7.8	5.4	25	27.1	31.8	1	1		
D5	Aug.	2.82	7.5	5.2	35	27.1	33.1	1	1		
D5	Sept.	2.10	7.8	6.5	26	28.1	31.1	1	1	15*10 ³	10*10 ²
D6	Aug.	3.05	8.0	5.6	33	27.2	32.2	1	1		
D6	Sept.	2.20	7.8	6.7	18	28.4	30.8	1	1	15*10 ³	25*10 ²
D7	Aug.	1.62	7.6	4.6	29	27.0	33.5	1	1		
D7	Sept.	1.56	7.8	6.4	24	27.5	31.3	1	1	19*10 ³	35*10 ²
D8	Aug.	2.07	7.6	5.8	31	27.2	33.0	1	1	19*10 ³	
D8	Sept.	1.07	7.7	6.5	28	28.6	31.2	1	1		

Table (2d) Water Quality Field Measurements for Irrigation water Supply

Site	Month	EC mmhos/cm	pH	DO mg/l	TURB NTU	Temp.(C)		*	*	Coliform MPN	Bacillus MPN
						Water	Air				
S1	Aug.	0.36	7.4	8.5	21	27.0	33.6	1	1		
S1	Sept.	0.37	7.7	7.3	16	27.3	32.6	1	1	8*10 ²	2*10 ²
S2	Aug.	0.37	7.4	7.6	23	27.0	33.4	1	1		
S2	Sept.	0.37	7.6	7.1	9	27.6	33.0	1	1	13*10 ³	10*10 ³

* Scale from 1 (normal irrigation/drainage water) to 5 (raw wastewater) is suggested in this report to describe the status of water quality as indicated by color and smell.

Some of the parameters shown in Table-2 such as EC, pH, DO and turbidity were also measured in the laboratory. Both results will be discussed.

The smelling and color of water show that water from Qalaa PS (D-1) is highly polluted. The effects of disposing untreated wastewater are also clear at the Max PS (U-1), Shiplock (U-7) and Maruit Lake (M-1).

The total Bacillus have been found in some sampling sites as shown in Table-2 and Figure-5. It was noticed that the highest values measured were at M-1 & M-2 while the smallest value was at U-4.

3.3 Collection of Water Samples

Parallel to the measurements, water samples were collected from the above twenty sites. Upon the request of the Employer, El A bd drain site (D-4) has been replaced by Nubariya drain site (U-8) for sampling in September. Water samples were collected from the upstream sides of the pumping stations. A practical factor have been considered in sampling location, which is the accessibility to the location via bridges. It provides ready access and also permit sampling at any point across the stream. Also, samples were taken from midpoint of the sampling location at least 30 cm below water surface and 30 cm from bottom to avoid floating solids and bottom sediment. In case of side flow (tributary drain or pumping station) discharging into the main water body, complete mixing distance has been considered to insure that the water quality sample is representative.

For each sampling location, 2 bottles have been collected, one glass bottle with volume of 2 liters and the other plastic bottle with volume of 1 liter. The collected samples are preserved in ice-boxes and transported directly to the laboratory for analysis.

3.4 Water Quality Survey

All the laboratory analyses were conducted according to the Standard Methods for the Examination of Water and Wastewater (17 edition, 1989).

3.4.1 Chemical Analysis

All the water samples from the twenty locations have been analysed for chemical analysis. These analyses include:

- Hydrogen Ion Activity (pH)
- Electrical Conductivity (EC)
- Total Suspended Solids (TSS)
- Soluble cations as :
 - * Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K)
- Soluble anions as ;
 - * Carbonates (CO₃), Bicarbonates (HCO₃), Sulphates (SO₄), Chlorides (CL)
- Sodium Absorption Ratio
- Adjusted SAR

Tables 3a to 3d comprise the chemical analysis results of the twenty one sites. it should be mentioned that these measurements have been taken during the months of August and September which are characterized by high discharges and low salinities. From the designated table, the followings can be summarized:

- * The laboratory and field measurements are in close agreement within the accuracy limits of the measuring devices.
- * The water quality of irrigation canals is excellent for irrigation.

- * Water salinity at some locations along the drains are moderate (EC less than 3.5 mmhos/cm). This water can directly be used for irrigation of salt tolerant crops or after mixing with fresh water for more sensitive crops.
- * The salinities of Omoum drain after mixing with Shereshera and Truga pump stations were 1920 and 2210 ppm at D-5, D-2 respectively. This water can be used for irrigation only after mixing with fresh water with a ratio of 1 : 2 to reduce its salinity to about 1,000 ppm.
- * Other locations have high saline water such as U-3, U-6. This water can not practically be used for irrigation.
- * The salinity of south western basin of Lake Mariut (M-2) is much higher than that of the main basin (M-1) because of the effect of Hares PS which evacuates its water to the south western basin as shown in Figure-6.
- * The salinity of north western basin of Lake Mariut (M-3) is too high because this basin is almost closed.
- * The salinity of site U-7 is considerably variable depending on the Petroleum factory effluent and the Shiplock condition.
- * The pH values for all the sites were within the range of 7-8 except at the Shiplock (U-7) where pH reached 8.9. This can be attributed to the presence of carbonate ion.
- * The dominant cations in the drainage water and lake Mariut are sodium ions while the chlorides are the dominant anions.

3.4.2 Biological Analysis and organic Matters

The water samples from the twenty sites have been analysed for biological and organic matters analyses. These analyses include:

- Total count of coliform bacteria
- Dissolved Oxygen (DO)
- Organic matter:
 - * Biochemical Oxygen Demand (BOD)

- * Chemical Oxygen Demand (COD)
- Total Suspended Solids (SS)
- Total Volatile Solids (VS)

Tables 4a to 4d present the results of these analyses. The followings can be recognized:

- * The drainage water of Qalaa pump station (D-1) is highly polluted by coliform bacteria.
This is due to the discharge of domestic wastewater of Alexandria Governorate. The drainage water of Qalaa PS flows directly to lake Mariut. This affects the quality of the lake which is noticeable by the presence of high value of coliform bacteria.
- * Dissolved oxygen in natural and waste water normally depend on the physical, chemical and biochemical activities in the water body. This is clearly indicated by the low values measured at M-1 and D-1 due to the polluted water lifted by Qalla PS.
- * The drainage water lifted by Qalaa PS is also characterized by high values of BOD and COD due to the discharge of industrial wastes from the industrial area near Alexandria.
- * BOD values as low as 2.4 and 4.2 mg/ℓ were measured at Omoum drain with the intersection with the Desert Road. This is due to the effect of self-purification by plants which were observed at this location and extended for about 15 m.
- * The water quality of the NW basin of Lake Mariut (M-3) complies with the standards set by Law 48.
- * The irrigation water of the upper reach of Nubariya canal (S-1) complies with the standards set by the national law of 48 of the year 1982 for both the coliform bacteria (< 5,000 MPN/100 cm³) and organic matters (10 and 15 for BOD and COD respectively)
- * The irrigation water of Khandak El Sharki (S-2) shows a slight increase in the values of biological and organic matter parameters than those specified in the Law.
- * There are some differences between the DO values measured in the field (Table 2) and those of the laboratory (Table-4). This is due to the accuracy limits of both instruments.

3.4.3 Nutrients

The water samples collected from five sites specified by the Employer have been examined for nutrients. The selected sites are M-1, M-2, M-3, U-5 and S-1. The analyses include:

- Total Phosphorus (T-P)
- Total Nitrogen (T-N)

The results of these analyses are also shown in Tables 4a to 4d. Total phosphorus and nitrogen at sites M-1 is extremely high due to the polluted water discharged into the lake and M-2 due to high density of water plant.

Table (2a) Chemical Analysis of Water

(Area: Mariut Lake)

No.	Sample Location	pH	EC at 25°C mmhos/cm	TDS	Cations Milli Equivalent per Liter				Anions Milli Equivalent per Liter				RSC	SAR	ADJ SAR
					Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL			
M1	Aug.	7.8	3.69	2048	3.38	6.10	23.5	0.75	0.00	2.55	5.07	26.11	10	22.5	
	Sep.	7.5	3.09	2021	4.04	4.68	22.4	0.65	0.00	1.37	13.6	16.8	11	18.65	
M2	Aug.	7.3	6.3	4120	3.72	12.79	45.0	0.97	0.00	2.25	41.7	18.51	15	33.70	
	Sep.	7.6	6.7	4353	6.62	9.30	52.6	0.90	0.00	1.23	27.37	40.82	18	33.68	
M3	Aug.	7.3	13.3	8801	5.72	25.48	112.5	2.30	0.00	1.75	33.6	110.61	28	60.70	
	Sep.	7.8	11.43	7169	7.82	9.54	99.00	2.00	0.00	1.00	21.31	96.05	33	55.42	

Table (2b) Chemical Analysis of Water

(Area: Omoum Drain)

No.	Sample Location	pH	EC at 25°C mmhos/cm	TDS	Cations Milli Equivalent per Liter				Anions Milli Equivalent per Liter				RSC	SAR	ADJ SAR
					Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL			
U1	Aug.	7.7	9.12	4646	8.32	17.48	53.2	0.71	0.00	1.45	10.0	68.23	14	30.3	
	Sep.	7.4	8.27	5087	7.22	13.74	61.6	1.28	0.00	1.20	21.88	60.76	19	35.5	
U2	Aug.	7.6	6.21	3686	6.89	10.03	44.2	0.56	0.00	1.23	11.70	48.70	15	28.0	
	Sep.	7.4	4.80	3121	6.88	7.68	35.0	0.76	0.00	1.22	17.76	31.34	13	23.5	
U3	Aug.	7.5	8.60	5313	6.50	15.46	67.4	0.71	0.00	1.20	12.6	76.19	20	38.0	
	Sep.	7.5	9.18	6220	8.20	17.68	75.0	1.70	0.00	1.54	26.74	74.30	21	42.7	
U4	Aug.	7.7	4.25	2776	4.03	8.93	30.0	2.18	0.00	1.38	12.9	30.85	11	21.8	
	Sep.	7.8	3.78	2405	5.59	6.17	26.0	0.65	0.00	1.50	14.45	22.46	11	20.2	
U5	Aug.	7.5	6.08	3717	6.24	10.2	45.0	0.92	0.00	1.47	10.1	50.84	15	30.3	
	Sep.	7.6	4.50	2823	6.19	7.41	31.6	0.75	0.00	1.22	14.06	30.67	12	21.8	
U6	Aug.	7.7	13.0	7828	6.50	25.9	100.0	0.75	0.00	1.23	20.0	111.9	24	48.7	
	Sep.	7.9	11.3	7300	6.32	20.6	90.0	1.70	0.00	1.19	40.29	77.14	25	46.6	
U7	Aug.	8.9	6.30	3892	2.21	10.15	51.45	0.70	0.40	1.07	14.0	49.01	20	37.7	
	Sep.	8.6	2.25	1468	3.35	3.13	16.3	0.36	0.22	0.79	9.55	12.58	9.1	13.4	
U8	Sep.	7.9	5.16	3337	9.46	9.98	32.5	0.68	0.00	0.97	27.6	24.05	10	18.5	

Table (2c) Chemical Analysis of Water

(Area: Branch Drains & Pumping Stations)

No.	Sample Location	pH	EC at 25°C mmhos/cm	TDS	Cations Milli Equivalent per Liter				Anions Milli Equivalent per Liter				RSC	SAR	ADJ SAR
					Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL			
D1	Aug.	7.3	2.42	1457	2.99	4.21	16.25	0.62	0.00	1.28	4.28	18.51	8.5	14.20	
	Sep.	7.5	2.49	1566	3.26	4.34	17.0	0.57	0.00	1.25	8.13	15.79	8.7	14.48	
D2	Aug.	7.6	3.30	2210	3.90	4.74	25.2	0.45	0.00	1.34	16.9	16.01	12	20.7	
	Sep.	7.7	2.44	1608	4.30	3.70	16.5	0.42	0.00	1.18	12.7	11.04	8.3	13.6	
D3	Aug.	7.6	5.19	3083	7.54	12.5	30.0	0.84	0.00	1.60	15.8	33.45	9.4	19.6	
	Sep.	7.7	3.54	2371	5.50	5.62	25.4	0.67	0.00	1.29	17.42	18.48	11	19.17	
D4	Aug.	7.5	5.00	4593	4.03	9.49	36.6	0.77	0.00	1.36	40.0	29.73	8.9	18.8	
	Sep.	-	-	-	-	-	-	-	-	-	-	-	-	-	
D5	Aug.	7.7	2.89	1920	2.21	4.43	22.5	0.36	0.00	2.43	13.7	13.36	12	23.9	
	Sep.	7.6	2.14	1426	3.89	3.33	14.3	0.37	0.00	1.25	11.98	8.64	7.5	12.47	
D6	Aug.	7.7	3.43	2353	2.73	6.59	26.4	0.42	0.00	1.43	21.1	13.61	12	21.6	
	Sep.	7.6	2.21	1518	4.30	3.46	15.0	0.40	0.00	1.28	13.43	8.45	7.6	12.88	
D7	Aug.	7.7	1.42	937	1.30	3.62	9.15	0.24	0.00	1.55	7.66	5.09	5.8	9.70	
	Sep.	7.4	1.57	1060	3.69	2.31	9.50	0.26	0.00	1.22	10.75	3.79	5.5	8.80	
D8	Aug.	7.6	2.18	1411	1.69	3.47	16.5	0.24	0.00	1.20	10.5	10.2	10	15.3	
	Sep.	7.7	1.99	1293	3.01	3.87	13.0	0.28	0.00	1.27	9.72	9.17	7.0	11.59	

Table (2d) Chemical Analysis of Water

(Area: Irrigation Canals)

No.	Sample Location	pH	EC at 25°C mmhos/cm	TDS	Cations Milli Equivalent per Liter				Anions Milli Equivalent per Liter				RSC	SAR	ADJ SAR
					Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL			
S1	Aug.	7.6	0.30	198	1.11	0.96	0.83	0.10	0.00	0.64	1.50	0.86	0.8	0.74	
	Sep.	7.7	0.38	262	1.72	0.74	1.30	0.12	0.00	0.63	2.39	0.86	1.2	1.12	
S2	Aug.	7.8	0.35	227	1.46	0.90	0.94	0.11	0.00	0.75	1.64	1.02	0.9	0.94	
	Sep.	7.5	0.40	276	1.54	0.70	1.70	0.13	0.00	0.63	2.48	0.96	1.6	1.45	

Table (3a) Biological Analysis

(Area: Mariut Lake)

Location Site	(Colon) Coliform MPN/100 cm ³	DO mg/L	BOD mg/L	COD mg/L	Turbidity NTU	Total Suspended Solids mg/L	Total Volatile Solids mg/L	Total Phosphorus mg/L	Total Nitrogen mg/L
M1 Aug. Sep.	24×10 ⁶ 15×10 ⁶	1.0 2.5	21.3 36	38.48 62.4	63 9	79 62	53.0 22	0.875 0.8	40.0 25
M2 Aug. Sep.	>24×10 ⁶ 4×10 ⁵	6.4 5.6	19.8 17.6	35.52 52.8	9 15	70 47	23 11	0.955 0.86	50.0 36
M3 Aug. Sep.	10×10 ² 23×10 ²	6.7 7.0	7.8 6.5	14.04 17.3	23 6	87 39	24 16	0.125 0.08	2.5 1.0

Table (3b) Biological Analysis

(Area: Omoum Drain)

Location Site	(Colon) Coliform MPN/100 cm ³	DO mg/L	BOD mg/L	COD mg/L	Turbidity NTU	Total Suspended Solids mg/L	Total Volatile Solids mg/L	Total Phosphorus mg/L	Total Nitrogen mg/L
U1 Aug. Sep.	24×10 ⁵ 43×10 ⁶	7.2 6.8	21.3 18.3	54.76 51.1	26 17	45 61	18 20		
U2 Aug. Sep.	75×10 ⁴ 93×10 ²	7.7 1.7	2.4 4.2	14.48 24.4	19 21	37 78	17 20		
U3 Aug. Sep.	43×10 ³ 93×10 ⁴	7.7 6.8	5.1 6.4	16.5 20.2	12 15	28 31	15 11		
U4 Aug. Sep.	43×10 ³ 43×10 ³	6.9 6.8	16.2 8.8	46.4 31.6	48 22	160 42	63 22	0.105 0.13	0.96 0.56
U5 Aug. Sep.	43×10 ³ 43×10 ³	6.7 6.6	16.2 14.6	46.64 38.4	48 25	160 29	63 7		
U6 Aug. Sep.	93×10 ³ 93×10 ³	6.7 7.5	16.2 13.4	39.68 35.2	24 13	42 22	23 12		
U7 Aug. Sep.	24×10 ³ 3×10 ⁴	6.6 7.0	13.8 10.2	26.22 21	35 23	104 53	78 29		
U8 Sep.	3×10 ⁴	6.3	10.5	31.7	42	28	13		

Table (3c) Biological Analysis

(Area: Branch Drains and Pumping Stations)

Location Site	(Colon) Coliform MPN/100 cm ³	DO mg/L	BOD mg/L	COD mg/L	Turbidity NTU	Total Suspended Solids mg/L	Total Volatile Solids mg/L	Total Phosphorus mg/L	Total Nitrogen mg/L
D1 Aug. Sep.	24×10 ⁶ 24×10 ⁷	0.6 0.8	56 69	346.32 238.2	183 45	273 21	119 9		
D2 Aug. Sep.	24×10 ³ 3×10 ⁴	7.7 7.0	17.1 12.5	102.12 85.11	25 29	81 11	41 4		
D3 Aug. Sep.	15×10 ³ 3×10 ⁴	8.9 7.0	14.7 11.4	38.8 29.6	14 18	191 70	87 19		
D4 Aug. Sep.	93×10 ²	8.5	22.9	37.56	13	71	60		
D5 Aug. Sep.	93×10 ² 3×10 ³	7.8 7.5	14.7 10.3	35.2 20.8	26 33	53 20	23 9		
D6 Aug. Sep.	93×10 ² 21×10 ³	6.5 7.1	6.6 8.7	17.76 23.04	17 58	122 45	73 16		
D7 Aug. Sep.	93×10 ³ 43×10 ⁴	6.3 7.0	6.9 7.2	16.2 14.4	11 17	44 59	20 15		
D8 Aug. Sep.	93×10 ² 3×10 ³	6.9 6.5	17.1 14.2	41.44 38.4	8 13	110 72	58 25		

Table (3c) Biological Analysis

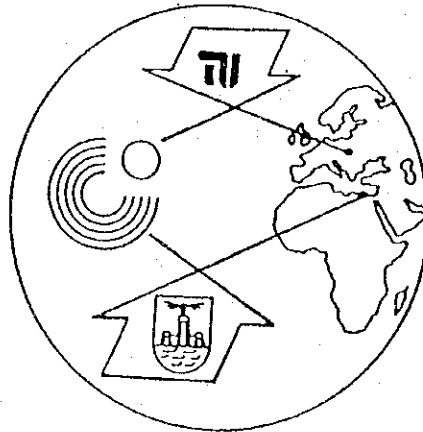
(Area: Irrigation Canals)

Location Site	(Colon) Coliform MPN/100 cm ³	DO mg/L	BOD mg/L	COD mg/L	Turbidity NTU	Total Suspended Solids mg/L	Total Volatile Solids mg/L	Total Phosphorus mg/L	Total Nitrogen mg/L
S1 Aug. Sep.	23×10 ² 15×10 ²	8.5 8.0	9.3 6.9	17.39 30.2	14 20	254 11	155 6	0.05 0.08	0.01 0.03
S2 Aug. Sep.	23×10 ⁴ 43×10 ⁴	8.0 7.6	14.4 9	20.14 27.4	15 15	43 31	19 17	- -	- -

**ANNEX J-1-B POLLUTION PROBLEMS AND PROPOSALS FOR RESTORATION AND BETTER
MANAGEMENT ON LAKE MARIUT**

**WORKSHOP
ON
LAKE MARIUT**
Pollution Problems and Proposals for
Restoration and Better Management

**April 27-30 1994
ALEXANDRIA**



RECOMMENDATIONS

organized by

GOETHE INSTITUT ALEXANDRIA

in cooperation with

**ALEXANDRIA UNIVERSITY
THE BRITISH COUNCIL ALEXANDRIA
WHO REGIONAL OFFICE, ALEXANDRIA**

1994

Recommendations

Lake Mariut, once a beautiful recreational area of Alexandria and a source of fish and fowl for the community, has through the pollution of its waters become a hazard to the ecological equilibrium of the region and to the health of the inhabitants of the city and its environs. If the lake is not restored as a healthy water-body immediately, these dangers will increase dramatically. On several aspects of this problem, research has been done by scientists both from Egypt and abroad. The aim of this workshop was to collect the results of this research and to provide the authorities concerned with recommendations for the restoration of the lake based on them.

These recommendations give an assessment of the sources of pollution and propose ways to eliminate it, both in the short and the long term. If these suggestions are implemented under a competent supervising authority, it should be possible to recreate an environment that does not endanger the health of the community. The lake and its environs could then offer facilities for recreation to the citizens of Alexandria, valuable places for further urban and agricultural development, and become a source of food for the community and of income to the people living on its shores.

1. MANAGEMENT

For the implementation of any measure to restore Lake Mariut, it is imperative that the lake and its environs be managed by a single agency (analogous to the Authority of the Asswan Dam and Lake Nasser). This agency should be placed under the direct supervision of the Governor in order to coordinate all activities affecting the lake. It should consist, at least in part, of representatives of the institutions that are already involved in any activities influencing the lake. The sole purpose of this agency, which may be instituted in the form of a committee, should be the restoration, rehabilitation (short- and long-term programmes) and the continuous supervision and management of Lake Mariut.

To be able to do this, the committee should be invested with all the necessary powers to instigate and put into effect all measures for the restoration of the lake. The committee needs to be supplied with independent funding (e.g. from the Governorate of Alexandria, EEAA, Alexandria Businessmen Association, and other non-governmental organizations). Funds for individual projects of restoration may be acquired from donor agencies or countries (as, for instance, the building of treatment plants, the first of which has been financed by USAID).

1.1. Lake Mariut Restoration and Rehabilitation Committee

1.1.1. Organisational form of the Committee

The committee should consist of two boards:

1.1.1.1. An executive steering board:

- Authorities:
1. Governor of Alexandria
 2. Alexandria University- Vice-President for Community Development and Environmental Affairs
 3. Egyptian Environmental Affairs Agency (EEAA)
 4. Alexandria City Council

- NGO's:
1. Businessmen Association
 2. Friends of the Environment of Alexandria
 3. Fishermen Syndicate

1.1.1.2. A scientific board:

This board consists of interdisciplinary scientists from the University of Alexandria and other research institutions, including the following departments:

Geology	Hydrology
Limnology	Biology
Public Health	Socio-economy
City planning	Soil and Water Chemistry
Ichthyology	

1.1.2. The duties of the committee in the short term (3 years)

- Restoration of the water body in quantity and quality,
- Monitoring the different parameters of the lake:
 - water level
 - lake surface area
 - sediment deposition
 - water quality
 - nutrients
 - oxygen
 - fish production and catch,

- Evaluation of the collected information and experiences which contribute to the setting up of a long-term plan.

1.1.3. The duties of the committee in the long term

In the long term, the committee should remain as an agency that monitors and controls all activities pertaining to the lake in order to prevent any further pollution.

2. CAUSES OF POLLUTION AND RECOMMENDATIONS FOR THEIR CONTROL

The following effluents and wastes have been identified as the most dangerous causes of pollution of Lake Mariut:

- Industrial effluents
- Solid waste (City garbage)
- Domestic waste water
- Agricultural run-off
- Air-borne pollutants.

The following proposals dealing with Lake Mariut pollution have been presented and discussed during the workshop:

2.1. Industrial Effluents:

At present, most industrial effluents enter the lake untreated. They constitute one of the greatest hazards to the lake, as they contain some highly toxic substances (e.g. mercury). These toxins enter the food-chain through contaminated fish and agricultural products irrigated by lake-water and endanger the health of the community. This hazard could be reduced drastically by the following measures.

2.1.1. Enforcement of the Law for Environmental Protection

The new Egyptian Law for Environmental Protection, that requires any factory to pretreat its effluents before discharging it in any water body, needs to be enforced strictly. This can be done in steps (Law 48/1982 and Law 4/1994). If this should place an undue strain on the finances of the companies concerned, they could apply to national or international institutions (e.g. donor countries or organisations) for interest-free loans or grants:

2.1.2. No new industrial development around the lake

The Governorate of Alexandria should not license the settlement of any new industry around Lake Mariut, but should encourage them to move to the new cities (e.g. Burg El-Arab). This would relieve the lake of further industrial effluents and increase the settlement of the new towns.

2.1.3. Treatment of the effluents of small industries

Small Industries (i.e. small factories and workshops) within the city at present discharge their, sometimes highly toxic, waste-waters into the communal drains. These waste-waters need to be treated differently from domestic waste-water to detoxify them efficiently. Therefore, a project should be set up in which the effluents of small factories are collected and treated separately in two or three treatment plants making use of well known industrial waste technology. Funding for such a project may be acquired in the same way as mentioned under point 2.1.1.

2.2. Solid Wastes (City garbage):

The uncontrolled dumping of Alexandria's solid waste near the borders of Lake Mariut is a hazard for the water quality of the lake and an extreme health hazard for the population of the whole of Alexandria. It pollutes not only the lake, but also the groundwater which may seep into the municipal water system. This may result in the infection of the population with hepatitis, typhoid fever, cholera and poliomyelitis and encourages the spread of Bilharzia. These causative organisms have already been identified in some areas around the lake.

2.2.1. Recommendations for their safe removal

The Governorate could in part finance a project to get rid of the city garbage. This could be done from the revenue from the 2% of the house rents for city cleaning. We have also been assured by representatives of several donor institutions and countries that funding such a project dealing with the disposal and further use of Alexandria's solid waste would receive top priority. Therefore, we suggest that such a project should be formulated immediately and presented to the donor agencies.

Meanwhile, dumping of solid waste near the lake should be stopped immediately. As an alternative, we propose to collect the garbage in two or more dumping places outside the city, taking the way Cairo deals with its solid waste as an example for sorting and recycling garbage (El-Mokkatam region). This will not only rid the city of its solid waste but will generate jobs and good income for many unemployed in Alexandria.

In the long term, this problem should be solved by installing several factories for city waste utilization.

2.3. Domestic waste water:

At present, 40% of the domestic waste-water of Alexandria is pretreated in two treatment plants. The pretreated water is then led into the lake, although it still contains a lot of organic and inorganic pollutants.

2.3.1. Recommendations for further treatment

The project phase for the necessary secondary treatment has already been planned and should be started as soon as possible to reduce the level of organic and inorganic pollutants of the lake.

2.3.2. Recommendations for further use of domestic waste-water

The remaining 60% of domestic waste-water should preferably be used for land reclamation. This could generate funds for the secondary treatment as well as provide Egypt with wood, a much needed agricultural product. However, as studies of the Faculty of Science at Sohag University show, this water cannot be used for the irrigation of food crops, because toxic heavy metals contained in this water will find their way into the crops. The city council of Sohag has therefore banned the use of domestic waste water (sludge) for the fertilization of edible plants (see Al Ahrâm of the 19/5/1994).

2.4. Agricultural run off:(El Omoum and El Qalaa Drains)

The water of the agricultural run off entering the lake is needed to fill the lake or raise its water level. Unfortunately, this is the only water source available for the lake apart from the domestic and industrial effluents. However, this water contains pesticide residues, which affect the utilization of the fish for human consumption.

2.4.1. Recommendations for treatment of agricultural run-off

There should be pretreatment of the agricultural run-off from El Oumoum and El Qalaa drains. This could be done through the creation of basins in which the water would be treated biologically by the planting and harvesting of certain species of aquatic plants (e.g. water-hyacinths and reeds), which have a high efficiency for absorbing inorganic (heavy metals) and organic pollutants (pesticides). Besides this important advantage the plants have the ability to increase oxygen levels (DO) in the water body. Only after such successive

treatment should the water of El-Oumoum and El Qalaa drains be released into the lake.

In the long-term, the influx of pesticides and the surplus of fertilizers could be restricted or hindered by agricultural regulations aiming at the control of pesticide application (qualitatively and quantitatively).

2.5. Air-borne pollutants:

The most dangerous type of this pollution is mercury emitted from the chlor-alkali plant of El-Nasr Chemical Co. The company is aware of this dangerous problem and has already instigated measures to change its technology to a more environmental friendly method, which is to be encouraged to start as soon as possible. Funding for this purpose has been already allocated.

3. RESIDUAL POLLUTION

Without the removal of toxins that are already in the lake, a restoration process cannot be complete. Therefore, also the present content of the lake basin has to be improved.

3.1. Sediment pollution

Many of the pollutants that have entered the lake during the past decades have settled into the lake sediment, where they form a toxic deposit which prevents any healthy growth of aquatic life. To restore the lake, this toxic sediment needs to be removed.

3.1.1. Recommendations for the removal of polluted sediments

The lake bottom should be dredged (in some basins) in order to clean the bottom sediments from the accumulated pollutants. This is a well known technology applied already in Egypt. The necessary equipment is available from the Egyptian Fisheries Company in Alexandria. As these sediments are highly polluted, they cannot be used for the growth of any edible plants or vegetables. On the other hand, the dredged sediments can be used as soil and fertilizer for a trial plantation for some species of Eucalyptus and Casuarina trees (cf. in Australia). Those trees could generate some further income as they could be sold for timber or manufacture into charcoal. Furthermore, they could act as wind and sand breakers to protect the lake. (see point 2.3.2.)

4. CONDITIONS OF THE RURAL COMMUNITIES AROUND THE LAKE

The people who have suffered most from the deterioration of the lake are the fishermen living in its environs. They are exposed to the greatest health hazard from the pollution of the water and are deprived of their income by the diminishing quantity and quality of the fish in the lake. This situation breeds social disintegration and unrest through poverty and ill-health. It is a disgrace and a hazard to the society that has condemned them to this pitiful state by destroying their natural livelihood.

4.1. Recommendations for the improvement of living conditions

The fishermen and their families could earn their living and help in the restoration of the lake, if a rural community development project could be set up to train and to pay them to act as environmental watchers of the lake. This could be achieved by teaching them how to cultivate aquatic plant species as described in 2.4.1. Their duties would then consist of tending the treatment basins at the influx of the agricultural drains and guard the lake against illegal dumping of solid or liquid waste. This can be started as a pilot project in a certain area of the lake and used as a model. This method will improve the water quality, contribute to the restoration of the lake, and ultimately will raise the quality and quantity of the edible fish in it. With more and better fish the income of the fishermen will increase again.

5. CONCLUSION

Lake Mariut is by no means the only lake in the world which suffers from the above-mentioned symptoms of deterioration. Throughout the world there is growing awareness of the hazards to health and society that such degradation poses. Action has been taken and it has been proven in several countries that highly polluted lakes (Lake Constance in Germany, Lake Tunis in Tunisia, Lake Okeechobee in Florida, USA) can be restored. Several of the techniques needed for the restoration of Lake Mariut have already been successfully used in Egypt and local studies have shown the feasibility of others. We therefore hope that with the implementation of these recommendations Lake Mariut will come to life again for the welfare of the community and all its inhabitants.

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Recommendations of Workshop on Lake Mariut - April 1994, Alexandria

