Table 3.25 Calculated Basic Flood Runoff in Sousse (1/4)

	Oued Blibene Basin	(Runott Co	alculation l	y Rational	Formula)					
				Present La	and Use Co	ndition		Future Lar	id Use Cor	dition
Calc	Sub-basin	Total	Runoff	Design	Calc.	Calc.	Runoff	Design	Calc.	Calc.
Point	Combination	Area	Coeff.	tc	Q(100)	Q(10)	Coeff.	tc	Q(100)	Q(10)
	4	(sq.km)	f	(min)	(cu.m/s)	(cu.m/s)	f	(min)	(cu.m/s)	(cu.m/s)
1	1	3.98	0.24	51	19,9	9.1	0.32	51	26.5	12.1
2	1-2	4.48	. 0.24	60	19.9	9.1	0.31	60	25.7	11.7
3	. 3	2.18	0.24	33	15.0	6.9	0.38	33	23.8	10.9
4	1-3	6.66	0.24	60	29.5	13.5	0.34	60	41.8	19,1
5	1-4	7.03	0.24	68	28.4	13.0	:0.33	68	39.1	17.9
6	5	0.85	0.24	24	7.4	3.4	0.50	24	15.5	7.1
7	1-5	7,88	0.24	68	31.8	14.6	0.35	68	46.4	21.2
8	1-6	9.14	0.24	88	30.5	14.0	0.36	68	45.8	20.9
9	11	0.37	0.40	16	7.3	3.3	0.80	16	14.5	6.6
10	10-11	0.94	0.47	25	15.6	7.1	0.80	25	26.5	12.1
11	8,10-11	1.29	0.49	35	17.4	6.0	0.80	35	28.4	13.0
12	9	0.16	0.36	-11	3.7	1.7	0.80	11	8.3	3.8
13	8-11	1.45	0.47	35	18.8	8.6	0.80	35	31.9	14.6
14	7-11	1.50	0.47	37	18.6	8.5	0.80	37	31.7	14.5
15	12	0.34	0.60	24	7.4	3.4	0.80	. 24	9.9	4.5
16	1-12	10.98	0.28	88	42.8	19.6	0.44	88	67.2	30.7
17	1-13	11.51	0.29	101	41.9	19.2	0.45	101	65.1	29.7
18	18	2.36	0.24	36	15.3	7.0	0.32	36	20.4	9.3
19	17-18	2.91	0.27	57	15.1	6.9	0.41	57	22.9	10.5
20	1-13,17-18	14.42	0.29	101	52.5	24.0	0.44	101	79.7	36.4
21	1-14,17-18	14.50	0.29	106	51.0	23.3	0.44	106	77.3	35.4
22	16	0.45	0.56	17	11.8	5.4	0.80	17	16.9	7.7
23	1-14.16-18	14.95	0.30	106	54.4	24.9	0.46	106	83.4	38.1
24	1.18	15.13	0.30	116	51.5	23.5	0.46	116	78.9	36.1

Table 3.25 Calculated Basic Flood Runoff in Sousse (2/4)

	Oued Hallouf Basin	(Runoff C	alculation l	by Rational	Formula)	1.5				
	•	.		Present L	and Use Co	ndition		Future Lac	nd Use Cor	ndition
Calc.	Sub-besin	Total	Runoff	Design	Calc.	Calc.	Runoff	Design	Calc.	Çelc.
Point	Combination	Area	Coeff.	tc	Q(100)	. Q(10)	Coeff.	tc	Q(100)	Q(10)
		(sq.km)	f	(min)	(cu.m/s)	(cu.m/s)	4	(min)	(cu.m/s)	(cu.m/s)
1 .	1	1.48	0.52	33	22.1	10.1	0.80	33	34.0	15.6
2	2	1.34	0.28	23	14.1	6.4	0.80	- 23	40.3	18.4
3	1-2	2.82	0.41	33	33.2	15.2	0.80	33	64.9	29.6
4	1-3	3.37	0.40	47	29.8	13.6	0.80	45	61.6	28.2
5	1.4	3.70	0.38	57	27.0	12.3	0.80	54	59.1	
6	6	1.51	0.24	32	10,7	4.9	0.50	32	22.2	10.2
7	6-7	3.09	0.26	53	16.3	7.4	0.53	53	33.2	15.2
- 8	1-4, 6-7	6.79	0.33	57	43.0	19.7	0.68	54	92.2	42.1
9	1-7	7.01	0.33	67	39.4	18.0	0.68	63	84.9	38.8
10	18	0.70	0.56	. 17	18.4	8.4	0.80	17	26.3	12.0
11	17-18	1.09	0.55	27	20.0	9.1	0.80	27	29.1	13.3
12	16-18	1.55	0.51	37	20.9	9.5	0.80	37	32.8	15.0
13	15-18	1.73	0.50	49	18.6	8.5	0.80	49	29.7	13.6
14	14	0.46	0.56	28	8.4	3.8	0.80	28	11,9	5.5
15	13-14	0.60	0.54	42	7.8	3.6	0.80	42	11.5	5.3
16	1-7, 13-18	9.34	0.37	67	58.8	26.9	0.71	63	118.1	54.0
17	1-8, 13-18	10.01	0.36	80	53.8	24.6	0.70	77	107.6	49.2
18	12	0.56	0.52	27	9.7	4.4	0.80	27	14.9	6.8
19	1-8, 12-18	10.57	0.37	80	58.4	26.7	0.70	77	113.6	51.9
20	1-9, 12-18	10.65	0.37	85	56.2	25.7	0.70	82	109.3	50.0
21	10	1.63	0.48	63	13,9	6.4	0.68	63	19.7	9.0
22	1-10. 12-18	12.28	0.39	85	68.4	31.2	0.70	82	126.0	57.6
23	1-18	12.34	0.39	90	65.9	30,1	0.70	87	121.2	55.4

Table 3.25 Calculated Basic Flood Runoff in Sousse (3/4)

	Oued Hammam Basin	(Bunoff C	alculation l	y Rational	Formula)				<u> </u>	
!				Present Le	and Use Co	ndition		Future Lar	nd Use Cor	dition
Calc.	Sub-basin	Total	Runoff	Design	Calc.	Calc.	Runoff	Dasign	Caic.	Calc.
Point	Combination	Area	Goeff.	tc	Q(100)	Q(10)	Coeff.	. tc	Q(100)	Q(10)
i		(sq.km)	ť	(min)	(cu.m/s)	(cu.m/s)	f	(min)	(cu.m/s)	(cu.m/s)
1	1	46.00	0.20	260	57.4	26.2	0.20	260	57.4	26.2
2	2	13.00	0.20	. 100	32,9	15.0	0.20	100	32,9	15.0
3	1-2	59.00	0.20	260	73.6	33.7	0.20	260	73.6	33.7
4	1-3	99.00	0.20	344	100.4	45.9	0.20	344	100.4	45.9
5	4	14.60	0.20	84	42.0	19.2	0.20	84	42.0	19.2
6	1-4	113.60	0.20	344	115.3	52.7	0.20	344	115.3	52.7
7	Dam 3 (Lais)	113.60	0.20	344	115,3	52.7	0,20	344	115.3	52.7
В	1-5	135.40	0.20	436	115.3	52.7	0.21	436	121.0	55.3
9 i	6	12.60	0.20	136	25.4	11.6	0.23	136	29.2	13.4
10	1-6	148.00	0.20	436	126.0	57.6	0,21	436	132.3	60.5
11	Dam 4 (R.BA)	148.00	0.20	436	126.0	57.6	0.21	436	132.3	60.5
12	1-7	163.00	0.20	506	124.3	56.8	0.22	506	136.7	62.5
13	Dam 5 (R.BB)	163.00	0.20	506	124.3	56.8	0.22	506	136.7	62.5
14	1-8	163.40	0.20	516	122.8	56.1	0.22	516	135.1	61.8
15	12	8.50	0.20	- 78	25.9	11.8	0.20	78	25.9	11.8
16	Dam 2 (M'darrej)	8.50	0.20	78	25.9	11.8	0.20	78	25.9	11.8
17	12-13	9.70	0.22	102	26.6	12.2	0.27	102	32.7	14.9
18	10	12.60	0.20	76	39,1	17.9	0.23	76	44.9	20.5
19	Dam 1 (Guemgame)	12.60	0.20	76	39.1	17.9	0.23	76	44.9	20.5
20	10-11	13.10	0.20	84	37.7	17.2	0.25	84	47.2	21.6
21	10-13	22.80	0,21	102	59.7	27.3	0.26	. 102	73.9	33.8
22	10-14	23.90	0.22	128	55.4	25.3	0.29	128	73.1	33.4
23	15	4.10	0.28	52	23.6	10.8	0.44	52	37.0	16.9
24	10-15	28.00	0.22	128	64.9	29.7	0.31	128	91.5	41.B
25	10-16	28.30	0.22	138	62.1	28.4	0.31	138	87.5	40.0
26	17	10.80	0.20	90	29.6	13.5	0.23	90	34.0	15.5
27	10-17	39.10	0.22	138	85.8	39.2	0.29	138	113.1	51.7
28	10-18	44.90	0.22	168	85.2	38.9	0.32	168	123.9	56.6
29	1-8,10-18	208.30	0.21	516	164.4	75.1	0.24	516	187.9	85.9
30	1-18	222.30	0.21	576	161.7	73.9	0.26	576	200.2	91.5

Table 3.25 Calculated Basic Flood Runoff in Sousse (4/4)

	Oued Hamdoun Basin	(Runoff Co	alculation i	by Rational	l Formula)		1 4	4 d 4	<u> </u>	
				Present L	and Use Co	ndition		Future Lar	nd Use Cor	ndition
Calc.	Sub-basin	Total	Runoff	Design	Calc.	Calc.	Runoff	Design	Calc	Calc.
Point	Combination	Area	Coeff.	te	Q(100)	Q(10)	Coeff.	tc	Q(100)	Q(10)
		(sq.km)	1	(min)	(cu.m/s)	(cu.m/s)	f.	(min)	(cu.m/s)	(cu.m/s)
1	1	120.30	0.22	402	119.6	54.7	0.23	402	125.1	57.2
2	1-2	144.40	0.22	458	130.4	59.6	0.22	458	130.4	59.6
3	3	13.00	0.22	136	28.8	13.2	0.23	136	30.1	13.B
4	1.3	157.40	0.22	458	142.1	65.0	0.23	458	148.6	67.9
5	1-4	170.60	0.22	500	144.4	66.0	0.25	500	164.1	75.0
6	5	7.80	0.20	114	17.9	8.2	0.26	114	23.3	10.6
7	1-5	178.40	0.22	500	151.0	69.0	0.25	500	171.6	78.4
8	1-6	179.00	0.22	508	149.7	68.4	0.25	508	170.1	77.8
9	7	11.30	0.20	118	25.3	11.6	0.20	118	25.3	11.6
10	1-7	190.30	0.22	508	159.2	72.8	0.25	. 508	180.9	82.7
11	1-8	193.10	0.22	548	152.7	69.8	0.25	548	173.5	79.3
12	18	21.70	0.22	142	46.6	21.3	0.23	142	48.7	22.3
13	Dam 1 (R.BA)	21.70	0.22	142	46.6	21.3	0.23	142	48.7	22.3
14	18-19	23.10	0.22	160	45.4	20.8	0.23	160	47.5	21.7
15	20	4.50	0.20	68	15.2	6.9	0.20	68	15.2	6.9
16	18-20	27.60	0.22	160	54.3	24.8	0.23	160	56.7	25.9
17	18-21	33.50	0.21	226	48.7	22.3	0.26	226	60.3	27.6
18	1-8,18-21	226.60	0.22	548	179.2	81.9	0.25	548	203.6	93.1
19	1-9,18-21	226.70	0.22	552	178.3	81.5	0.25	552	202.6	92.6
20	10	6.90	0.20	120	15.3	7.0	0.20	120	15.3	7.0
21	1-10,18-21	233.60	0.22	552	183.7	64.0	0.25	552	208.8	95.4
22	1-11,18-21	234.60	0.22	566	181.1	82.8	0.25	566	205.8	94.1
23	22	20.40	0.20	166	35.5	16.2	0.26	166	46.1	21.1
24	1-11,18-22	255.00	0.22	566	196.9	90.0	0.25	566	223.7	102.3
25	1-12,18-22	256.50	0.22	578	195.5	69.4	0.25	576	222.1	101.5
26	Dam 2 (R.BB)	256.50	0.22	576	195.5	89.4	0.25	576	222.1	101.5
27	1-13,18-22	265.40	0.22	604	195.3	89.3	0.25	604	221.9	101.4
28	14	7.50	0.20	86	21,2	9.7	0.20	86	21.2	9.7
29	1-14,18-22	272.90	0.22	604	200.8	91.8	0.25	604	228.2	104.3
30	1-15,18-22	284.90	0.22	672	193.7	68.6	0.25	672	220.1	100.6
31	16	26.20	0.22	174	48.4	22.1	0.23	174	50.6	23.1
32	1-16,18-22	311.10	0.22	672	211.5	96.7	0.25	672	240.4	109.9
33	1-22	312.60	0.22	692	208.1	95.1	0.25	692	236.5	108.1

Table 3.26 Calculated Flood Runoff in Sousse (1/2)

			Future Land Use Condition	d Use Con	dition								-		
Calc.	Sub-basin	Bezie	Basic	HM 2	HM 2	HM.3	HM-3	H.M.4	HW-4	HM:3	HM.3	HW 6	HM 6	HM.7	HW 7
Point	Combination	Q(100)	Q(10)	a(100)	Q(10)	Q(100)	Q(10)	Q(100)	Q(10)	Ω(188)	Q(10)	0(100)	Q(10)	Q(100)	Q(10)
	THE THE PARTY OF T	(cn.m/s)	(c/m.no)	(cn.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/a)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(ca.m/s)	(cn.m/s)	(cu.m/s)
-		57.4	28.2	57.4	26.2	57.4	26.2	57.4	26.2	57.4	26.2	57.4	26.2	57.4	26.2
2	CV.	32.9	15.0	32.9	15.0	32.9	15.0	32.9	15.0	32.9	15.0	32.9	15.0	32.9	15.0
က	1.2	73.6	33.7	73.6	33.7	73.6	33.7	73.6	33.7	73.6	33.7	73.8	33.7	73.6	33.7
*	1.3	100.4	45.9	100.4	45.9	100.4	45.9	100.4	\$3.9	100.4	45.9	100.4	45.9	100.4	45.9
6	4	42.0	19.2	42.0	19.2	42.0	19.2	45.0	19.2	42.0	19.2	42.0	19.2	42.0	19.2
ဖ	1.4	115.3	52.7	115.3	52.7	115.3	52.7	115.3	52.7	115.3	52.7	115.3	52.7	115.3	52.7
7	Dem 3 (Lais)	115.3	52.7	115.3	52.7	115.3	52.7	0.0	0.0	115.3	52.7	115.3	52.7	0.0	0.0
ø	1-5	121.0	55.3	121.0	55.3	121.0	55.3	19.5	6.8	121.0	55.3	121.0	553	19.5	8.9
6	4	28.2	13.4	29.2	13.4	29.2	13.4	29.2	13.4	29.2	13.4	29.2	13.4	29.2	13.4
õ	1.6	132.3	60.5	132.3	60.3	132.3	60.5	30.8	14.1	132.3	60.5	132.3	8	30.8	14.1
=	Dam 4 (R.BA)	132.3	60.5	132.3	60,5	132.3	60.5	30.8	14.1	58.3	66	132.3	80.5	0.0	0.0
12	1.7	136.7	62.3	136.7	62.5	136.7	62.5	414	18.9	72.9	17.0	136.7	62.5	12.6	5.7
13	Dam 5 (R.B.·3)	138.7	62.5	136.7	62.5	136.7	62.5	41.4	18.9	72.9	17.0	0'0	0.0	0.0	0.0
4	8,1	133.1	61.8	135.1	61.8	138.1	61.8	41.2	18.8	72.6	1.71	0.3	0.2	0.3	0.5
Ð	12	25.9	11.8	25.9	11.8	25.9	11.8	25.9	11.8	25.9	11.8	25.9	1.8	25.9	11.8
9	Dem 2 (M'darrej)	25.9	11.8	25.9	11.8	0.0	0.0	25.9	11.8	25.9	11.8	25.9	11.8	0.0	0.0
12	12-13	32.7	14.9	32.7	14.9	4.0	1.8	32.7	14.9	32.7	14.9	32.7	14.9	4.0	1.8
20	10	44.9	20.5	44.9	20.5	44.9	20.5	44.9	20.5	44.9	20.5	44.9	20.5	44.9	20.5
6	Dam 1 (Guemgame)	44.9	20.5	0.0	0.0	44.9	20.3	44.9	20.5	44.9	20.5	44.9	20.5	0.0	0.0
50	10.11	47.2	21.6	6.	0.8	47.2	21.6	47.2	21.6	47.2	21.6	47.2	21.6	1.8	80
-2	10.13	73.9	33.8	33.1	15.1	46.4	21.2	73.9	33.8	73.9	8.55	73.9	33.8	3.5	2.5
8	10-14	73.1	33.4	34.6	15.8	47.1	21.5	73.1	33.4	73.1	33.4	73.1	33.4	3.6	8
ន	13	37.0	16.9	37.0	16.9	37.0	18.9	37.0	16.9	37.0	16.9	37.0	16.9	37.0	16.9
24	10.15	91.5	41.8	50.3	23.0	63.7	29.1	91.5	41.8	91.5	41.8	91.5	41.8	22.6	10.3
52	10.16	87.5	40.0	48.5	22.2	61.2	27.2	67.5	40.0	87.5	40.0	87.5	40.0	22.3	10.2
58	2.5	94.0	15.3	34.0	13.5	34.0	15.5	34.0	15.5	34.0	15.5	34.0	15.5	340	15.5
27	10.17	113.1	51.7	76.6	35.0	88.5	40.5	113.1	51.7	113.1	51.7	113.1	51.7	52.1	23.8
28	10.18	123.9	36.6	88	40.7	100.4	45.9	123.9	9.96	123.9	56.6	123,9	26.6	65.7	98
53	1.8,10.18	187.9	85.9	176.5	80.7	180.2	82.4	83.4	0.6€	123.1	39.4	40.9	18.7	21.8	10.0
8	1:18	200.2	91.3	188.9	86.3	192.6	88.0	97.9	44.8	141.7	48.2	53.4	24.4	4.4	15.7

Table 3.26 Calculated Flood Runoff in Sousse (2/2)

Oued Hamdoun Basin

Future Land Use Condition Beats HD.2 HD.2 HD.3 HD.3 HD.4 HD.4	Q(10) Q(100) Q(10) Q(100)	(cu.m/s) (cu.m/s) (cu.m/s)	57.2 125,1 57.2 125,1	39.6 130.4 39.6 130.4	13.8 30.1 13.8 30.1	67.9 148.6 67.9 148.6	73.0 154.1 75.0 164.1	10.6 23.3 10.6 23.3	71.6 78.4 171.6 78.4 171.6 78.4	70.1 77.8 170.1 77.8 170.1 77.8	25.3 11.6 25.3 11.6 25.3 11.6	80.9 82.7 180.9 82.7 180.9 82.7	73.5 79.3 173.5 79.3 173.5 79.3	22.3 48.7 22.3 48.7	0.0 0.0 48.7 22.3 0.0 0.0	2.9 1,3 47,5 21.7 2.9 1.3	15.2 6.9 15.2 6.9 15.2 6.9	12.1 5.5 56.7 25.9 12.1 5.5	9.7 60.3 27.6 21.2	94.1 84.2 203.6 93.1 184.1 84.2		15.3 7.0 15.3 7.0 15.3 7.0	86.6 208.8 95.4 189.4	36.8 85.4 205.8 94.1 186.8 85.4	16.1 21.1 46.1 21.1 46.1 21.1	M.7 93.6 223.7 102.3 204.7 93.6	33.3 93.0 222.1 101.5 203.3 93.0	33.3 93.0 131.0 41.0 118.2 35.4	93.1 136.6 43.8 124.0	9.7 21.2 9.7 21.2	96.0 142.9 46.7 130.3	93.0 146.9 49.2 134.5	23.1 50.6 23.1 50.6 23.1	1000 1670 585 1548
HD.2 HD.2	Q(100) Q(10)	(cu.m/s) (cu.m/s)	125.1 57.2	130.4	30,1	148.6	1291	23.3	171.6	170.1	25.3	180.9	173.5	48.7	0.0	2.9	15.2	12.1	21.2	184.1	183.2	15.3	189.4	186.8	46.1	204.7	203.3	203.3	203.8	21.2	210.0	203.4	20.6	3 223.6 102.2
Basic Basic		-	┼	130.4 59.6	30.1	148.6 67.9		23.3 10.6	171.6 78.4	170.1	25.3 11.6	180.9 82.7	173.5 79.3	48.7 22.3	48.7 22.3	47.5 21.7	15.2 6.9	56.7 25.9	60.3 27.6	203.6 93.1	202.6 92.6	15.3 7.0	208.8 95.4	205.8 94.1	46.1 21.1	223.7 102.3	222.1 101.5	222.1 101.5	221.9 101.4	21.2 9.7	228.2 104.3	220.1 100.6	50.6 23.1	240.4 109.9
Sub besin	Combination			1.2	8	1.3	4.4	ۍ.	1.5	1.6	7	2.1.	8-1	18	Dam 1 (A.B. A)	18-19	20	18-20	18-21	1.8,18.21	1-9,18-21	10	1-10,18-21	1-11,18-21	22	1.11,18.22	1-12,18-22	Oem 2 (R.B. B)	1.13,18.22	4	1-14,18-22	1-15,18-22	16	1.16,18.22
Calc	Point			22	Ŋ	w	c	G	7	۵	o	õ	=	江	5	47	5	16	4	ē	65	8	21	23	23	24	23	26	27	28	8	8	34	ଞ

Table 4.1 PRESENT LAND USE COMPOSITION IN GREATER TUNIS

		GOVERN	GOVERNORATE	
LAND USE CATEGORY	TUNIS	ARIANA	BEN AROUS	TOTAL
	AREA (km2)	AREA (km2)	AREA (km2)	AREA (km2)
URBAN AREAS	105	122	601	331
AGRICULTURAL AREAS	100	1053	358	1497
SEBKHET	26 (Sijoumi)	50 (Ariana)	l	76
LAKE	42 (Tunis fake)	1	ļ	42
GREEN AREAS	15	333	220	582
TOTAL	288	1,558	289	2,528

Source: Identification Brochure of each Governorate

Table 4.2 PRESENT BUILT-UP URBAN AREAS IN GREATER TUNIS

			GO,	VERN	GOVERNORATE			
CATEGORY	SINUL		ARIANA	4	BEN AROUS	SO	TOTAL	
	AREA (km2) (%)	(%)	AREA (km2) (%)	(%)	AREA (km2) (%)	(%)	AREA (km2)	(%)
FORMAL HOUSING	38.91	53	15.22	21	18.92	26	73.05	100
SPONTANEOUS HABITAT	10.57	3.1	91'61	54	5.17	1.5	34.90	100
SOCIAL INFRASTRUCTURES	8.89	49	86.5	33	3.33	<u>8</u>	18.20	100
INDUSTRIAL ZONES	5.76	34	3.66	22	7.32	44	16.74	100
TOTAL	64.13		44.02		34.74		142.89	

Source: Brochure of the Governorate of Tunis

Table 4.3 PRESENT FLOOD PRONE LOCALITIES IN GREATER TUNIS (1/4)

	LOCATION	ENCOUNTRED PROBLEM	OBSERVATIONS
	Governorate of Ariana		
:	Cité Al-Intitaka Municipality of M'nihla East of MC 31 road to Raoued	Temporary flooding area resulting from housing constructions that obstruct the stormwater flows.	Presence of dike that was constructed by ONAS to divert flows to storm basin at Nougra. However problems still persist.
4	Cité At-tadhamen Municipality of Wadi-Ellil West of MC 31 road to Raoued North of Sebkhet Ariana	Serious flooding problem resulting from construction of spontaneous settlements in the river bed of Oued Gariana and obstruction of stormwater flows.	Absence of drains, road gullies and stormwater system.
ຕ່	Sidi Amor-Municipality of Ariana. Along the RVE 533 road to Raoned. North of Sebkhet Ariana	Important flooding problem due to the presence of wastewater canal of ONAS that obstructs the run off of stormwater flows.	Flat lands that do not dispose of any drainage infrastructure. Presence of spontaneous habitat. Drainage design works are needed.
₹	Borj El-Khsous at Raoued in the Municipality of Ariana.	Temporary flooding area due to the presence of canl ONAS that blocks the discharge of stromwater flows	Flat area deprived of dramage infrastructure and requires design work.
ĸ;	Borj-Louzir, Municipality of Ariana, In the the plain of Choutrana between GP10 and GP8 roads	Serious flooding problems resulting from construction of spontaneous settlements that obstruct the existing stromwater earth drains.	Flat lands deprived of drainage infrastructure and presence of water table at shallow deplat.
હ	Cité Mostakbal-Municipality of Ariana between the GP8 and the RVE 533 road to Raoued	Significant flooding problem resulting from the construction of spontaneous housing that obstruct the natural flow of stormwater.	flat land deprived of draimage infrastructure.
7.	El-Boustene-Municipality of Ariana-in the plain of Choutrana North of GP10 road	Serious permanent flooding problems resulting from construction of spontaneous settlements that obstruct the existin stormwater carth drains.	flat fand deprived of drainage infrastructure and presence of water table at shallow depth.

Source: District of Tunis

Table 4.3 PRESENT FLOOD PRONE LOCALITIES IN GREATER TUNIS (2/4)

	LOCATION	ENCOUNTRED PROBLEM	OBSERVATIONS
∞:	El-Mansoura-Municipality of Ariana-plain of Choutrann East of GP8 road	Critical permanent flooding of spontaneous settlements due to the absence of drains and poor soil conditions.	Flat area deprived of drainage and sewerage infrastructure and high water table.
6	La Soukra-Municipality of Ariana. South of Scbkhet Ariana along the GP10 road	Serious permanent stagnation of water as a result of absence of drains and poor soil conditions.	Flat area deprived of drainage infrastructure and high water table.
	Dar Fadhal- Municipality of Ariana- South of Scbkhet Ariana along the GP10	serious permanent flooding of water due to absence of drains and unsuitable soil conditions.	Problem area is deprived of drainage infrastructure and high water table.
=	Raoued-Municipality of Ariana-North and East of sebkhet Ariana Governorate of Tunis	Area suffering from significant flooding problems during rain season due to the presence of canal ONAS to the north, the road to Gammarth on the East and poor soil conditions that hinder run off and discharge operations.	Relatively flat lands deprived of drainage facilities and having a high water table tevel.
2	Al-kram and Khayreddinen-Municipality of La Goulette at the north-cast corner of Tunis Lake	Scrious flooding during the rain season due to hpousing constructions that obstruct run off flows.	The canal ONAS that is supposed to serve the area is obstructed and is not allowed to discharge in the North lake.
ä	Faubourg of the Medina. La Fayette and Petite Sicile-Municipality of Tunis in the city center west of Tunis Lake	Area of temporary flooding during rainy season due to low lying flat lands in heaviv constructed areas.	The existing drainage system is under sized and laid flat. ONAS is in the process to rehabilitate the existing system.
1	As-Saida. Al Mallassinc- Municipality of Bardo- North bank of Scbkhet Scjoumi	Area suffering from imoprtant flooding problem during raining events due to low lying lands that receive the run off flows of higher lands situated on the north side.	Flat basin area surrounded by higher lands and the Sebkhet Sejoumi-Absence of drainage protection facilities.

Source: District of Tunis

Table 4.3 PRESENT FLOOD PRONE LOCALITIES IN GREATER TUNIS (3/4)

	LOCATION	ENCOUNTRED PROBLEM	OBSERVATIONS
	Governorate of Ben-Arous		
<u>v.</u>	Port de Rades-Municipality of Rades-East of Tunis Lake	Important temporary flooding problem due to presence of depression and poor soil conditions.	Flat low lying area deprived of drainage system and suffering from high water table problems.
<u>16.</u>	Mouth of Oued Milyane-Municipality of Rades	Serious flooding problem during rainy season due to low lands near mouth of oued Milyane.	Area situated in basin of Oued Milyane with flat topography and presence of high water table.
17.	Sidí Fathallah -Municipality of Boumhel- Area located between GP1 and MC 39 roads	Important flooding area due to housing constructions that obstruct the natural drainage of area.	Flat lands suffering from insufficient drainage protection facilities.
%	Municipality of Boumhel - Area located between GP10 and MC 39 road.	Important flooding area due to housing constructions that obstruct the natural drainage of the area.	Flat lands suffering from insufficient drainage protection facilities.
61	Bir-Alkasa'a, Municipality of Ben Arous between the Autoroute and GP1 road.	Area experiencing seasonal inudations due to the presence of constructions.	Flat land surrounded by higher grounds and deprived of proper drainage protection system.
20.	Wadi Traboulsiya- Municipality of Hammam-Lif South of GP1 Road	Scrious flooding problem due to the presence of spontaneous settlements that obstruct the natural drainage of stormwater.	Flat low lying area surrounded by higher lands and deprived of an adequate drainage protection system,
21.	Zaouict Mornag and Mornâg- Municipality of Mornâg along MC 35 road	Important flooding problem during rainy season resulting from housing construction that obstruct the drainage operation.	Area with flat topography deprived of an adequate drainage protection system.
22.	Sidi-Saad-Municipality of Mornag- along Oucd Hama	Serious flooding problem caused by overflows from Oucd Hama and run off from surrounding areas.	Flat area surrounded by highler grounds deprived of an adequate drainage protection with existing system that needs maintenance.

Source: District of Tunis

Table 4.3 PRESENT FLOOD PRONE LOCALITIES IN GREATER TUNIS (4/4)

	LOCATION	ENCOUNTRED PROBLEM	OBSERVATIONS
23.	Al-khalidya-Municipality of Mornag- along MC 36 road	Important flooding problem during rainy season due to spontaneous housing that obstruct the natural drainage flow.	Area requiring an adequate drainage an adequate drainage protection system.
27.	Fouchana center-Municipality of Fouchana on GP 3 road.	Serious flooding problem during rainy season due to spontaneous settlements that obstruct the natural drainage flow.	Low lying area requiring an adequate drainage system.
25.	Hammant-Chatt Municipalitiv of Hammant Chatt Nord of GP 1 road	Area suffering from scrious flooding problems due to poor topographic and sol conditions.	Flat low area surrounded by Mount Bougornine to the south and the sea to the north and deprived of adequate drainage protection system and suffering from high water table.

Source: District of Tunis

Table 4.4 LAND ALLOCATION FOR URBAN DEVELOPMENT IN GREATER TUNIS

TASK No	YEARS 1993-1996 - Densification of present Urban areas - Restructurating of urban expansion areas in the North and West - Execution of the following urban projects:	AREA/ EXPECTED YEAR OF COMPLETION
	North of the Ariana Zone west of GP8 road. Residence Annasr II & 11 a The North Tunis lake Residence El-Mourouj IV Residence El-Mourouj V Borj Cedria	171 ha/ 1996 140 ha/ 1996 250 ha/ after 1996 482 ha/ 1993 120 ha/ 1996 230 ha/ 1996
	- Densification and restructurating operation of urban expansion areas - Development of the South Tunis lake Development of urban expansion areas (UAE) in the South Fouchana and Mhanudia UAE Zahra and Hamman Lif UAE	195 ha/ 2001- 2011 1900 ha/ to be devloped on the basis of supply and demand 540 ha/ 1996-2001
	- Development of urban expansion areas (UEA) in the Ouest El-Manzah and Mnithla UAE West bank of Sebkhet Sejoumi UAE - Development of urban expansion areas (UAE) in the North Community of Ariana North Zone of Raoued	880 ha/ 1996-2001 1120 ha/ to be developed on the basis of supply and demand 904 ha/ 2001-2011 700 ha/ 2001- 2011

Source: Municipal Urban Development Plans of Ariana, Tunis, El-Mourouj, Hammam-Chott, Fouchana, M'hamdia and Sejoumi,

Table 4.5 CONCEIVABLE DEVELOPMENT PROJECTS FOR SEBKHET ARIANA

TASK N°	PROJECT DESCRIPTION	OBSERVATIONS
yeat	DREDGING - Dredging operation of the bottom of the Sebkhet to increase its depth and therefore its capacity. Dredged materials can be used for land reclamation along the banks and for the existing landfill site on the East bank of the Sebkhet.	The Average depth of water in the Sebkhet is around 70 cm which entails a moderate cost for dredging operation.
N	FISH BREEDING - Fish farming, shellfish and scaweed growing can be considered potential operations as a result of dredging works. However, these operations need to be justified through a feasibility study.	A study is to be carried out to determine the type of waters to be used (i.e sweet or salty waters), the quality and the quantities of water needed, the existing and the planned infrastructures and the market demands.
en	LEISURE ACTIVITIES - Creation of recreational areas along the banks of the Sebkhet particularly during the summer season when the water surface is reduced.	The selection of the type of recreational activities will require site preaparation and installation of basic infrastructure facilities.
ব	SALT WORKS - Creation of salt works at Bahr El-Azrag just west of the existing treatment plant coastal North.	This operation will require a feasability study before its implemantation.
w	LAND RECLAMATION - Reciamation of the entire Sebkhet for urban development.	This is a large scale and a long term operation that is to be justified by a feasability study based on the orientations and the needs for future development.

Source: JICA Study Team (1993)

Table 4.6 PRESENT LAND USE COMPOSITION IN GREATER SOUSSE

					DELE	DELEGATIONS				
LAND USE CATEGORY SOUSSE* Area (Ha)	SOUSSE* Area (Ha)	HAMIMAM SOUSSE Area (Ha)	KALAA KBIRA Area (Ha)	MSAKEN Area (Ha)	KALAA SGHIRA Area (Ha)	AKOUBA Area (Ha)	AZ- ZOUHOUR Area (Ha)	ZAOUIAT SOUSSE Area (Ha)	KSIBA Area (Ha)	TOTAL Area (Ha)
URBAN AREAS	1.014	853	340	919	210	150	46	70	911	3,415
AGRICULTURAL AREAS	380	1,310	1.680	4.920	810	026	1.525	590	528	12,713
INDUSTRIAL AREAS	7 7	245	17	162	Ŷ	2	1	,	**	894
GREEN AREAS	148	150	0110	200	32	50	'n	ĸ	67	7.19
SEBKHET/LAKE	08	•	; •	•	•	•	ı		. •	\$
TOTAL	2,036	2,558	2,147	8,898	1,092	1,182	1,576	665	697	17,851

Source : Urban Development Master Plan of Sousse and Monastir - March 1993

* Sousse + Sousse Riadh

Table 4.7. PRESENT FLOOD PRONE LOCALITIES IN GREATER SOUSSE (1/3)

	LOCATION	ENCOUNTRED PROBLEM	OBSERVATIONS
	Sousse		
-	Oued Naouar south of the port of Sousse on Avenue Tareb Ghachem	Scrious flooding area due to the depression of the site and the obstruction of existing outlet structure.	Rehabilitation works are required. The existing oued is to be replaced by a concrete canal.
7	La place Lubliana West of the Port of Sousse near the cemetry	Important flooding area during rainy season as a result of obstruction of sorm flows.	Low-lying area deprived of drainage infrastructure.
ฑ่	West of the Medina at the interssectionof Bejaoui road and Ave. Karoui	Temporary flooding area due to the presence of construction.	Low-lying area deprived of adequate drainage system.
+	Canal Sidi Bou Kacem between the GP12 and RVE 822 roads near Al-Aouina	Serious flooding problem resulting from overflows of canal.	Low-lying depressed area requiring flood protection works.
vi	Oucd Kharroub South of the GP1 road	Flooding of the upstream sections of the oued due to existing constructions obstructing the runoff flows and shallow river bed	Rehabilitation of the bed of the Oued is needed to improve the carrying capacity
હ	North of khezma El-Gharbia along the GP1 road.	Scrious flooding problem in rainy events due to the depressed site and presence of constructions	Low-lying area deprived of adequate drainage facilities
7.	Area located between the GP1 and the touristic road	Frequent flooding problem resulting from runoff flows from the area west of GP1.	Low lying area receiving the storm flows from surrounding higher grounds and deprived of a drainage system.

Source: DHU documentation Service.

Table 4.7 PRESENT FLOOD PRONE LOCALITIES IN GREATER SOUSSE (2/3)

Innuman between the Frequent flooding problem resulting from runoff flows from the area west of the GPL. Serious flooding problem caused by existing construction and degraded river bed. Important flooding problem during rainy season. Interportant flooding problem during rainy events resulting from heavy deposits and flat river bed. Temporary flooding problem caused by heavy run off flows from higher grounds. Temporary flooding during rainy season due to presence of constructions and very shallow river bed. Serious flooding during rainy season due to a flooding due to the presence of constructions in the river bed. Serious flooding due to the presence of a departed zone in an anticularial area.				
Area situated north of Oued Hammann between the GP and the touristic road Area from the area vest of the GP and the touristic road Area located north of Zaouiet Sousse along the GP and the area vest of the GP and the touristic road Akouda Akouda At intersection Oued Sghir and the road of June 15t Serious flooding during rainy season due to presence of constructions in the river bed. Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a herdres and contents of Akonda Adjacent zones of Oued Kebir between railway. Important flooding due to the presence of a herdres and contents of Akonda Academy and a flooring problem resulting from trunning rainy season due to presence of constructions in the river bed. Serious flooding due to the presence of a herdresof zone in an area of the presence of a herdresof zone in an area of the presence of a depresence of the presence of the presence of a depresence of the presence of the pre		LOCATION		OBSERVATIONS
Area situated north of Oued Hammann between the GP1 and the touristic road Oued Hammann west of the GP1 Serious from the area west of the GP1. Serious flooding problem caused by existing construction and degraded river bed. Aloued Hammann west of the GP1 Serious flooding problem caused by existing construction and degraded river bed. Aloued Robir and the GP1 Serious flooding problem caused by existing constructions and triver bed. Temportant flooding problem during rainy season. Aloued Robir and the road of June 1 ^{S1} Serious flooding during rainy season due to gresence of constructions and very shallow river bed. Al intersection Oued Sghir and the road of June 1 ^{S1} Serious flooding due to the presence of a hride and entrance of Akonda		Hammam Sousse		
Oued Hammann west of the GP1 Zaouiet Stutsse Area located north of Zaouiet Sousse along the RVE 822 road Aliounda Urban zone at intersection of Oued Kebir and MC Areas located along the MC 48 road At confluence of Oued Mdarrej and oued Sucrement on MC48 road At intersection Oued Sighir and the road of June 151 Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a departed and constructions in the river bed. Serious flooding due to the presence of a departed and constructions in the river bed. Serious flooding due to the presence of a departed and constructions in the river bed. At intersection Oued Sighir and the road of June 151 Serious flooding due to the presence of a departed and contrance of Akonda	∞:	Area situated north of Oned Hammann between the GP1 and the touristic road	Frequent flooding problem resulting from runoff flows from the area west of the GP1.	Low lying area deprived of a proper drainage facilities.
Area located north of Zaouiet Sousse along the RVE 822 road Akouda Akorden and outhortant flooding problem during rainy season. Akouda Akorden and outhortant flooding problem during rainy season. Important flooding problem during rainy season. Temporary flooding problem caused by heavy run off flows from higher grounds. At confluence of Oued Marrej and oued Serious flooding during rainy season due to presence of presence of constructions in the river bed. Serious flooding due to the presence of a depressence of a departed zone in an activitival area.	6	Oucd Hammam west of the GP1 Zaouiet Source	p ò	Rehabilitation works of the river bed are required.
Areas located along the MC 48 road Areas located along the MC 48 road At confluence of Oued Marrej and oued Guenguem on MC48 road At intersection Oued Sphir and the road of June 1 St Adjacent zones of Oued Kebir between railway Important flooding problem during rainy events resulting from heavy deposits and flat river bed. Temporant flooding problem during rainy events bed. Temporant flooding problem during rainy events bed. Temporant flooding during rainy season due to presence of constructions and very shallow river bed. Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a departed zone in an arrichlural area.	<u></u>	Area located north of Zaouiet Sousse along the RVE 822 road	Important flooding problem during rainy season.	Low lying area deprived of proper drainage infrastructures.
Urban zone at intersection of Oucd Kebir and MC Areas located along the MC 48 road Areas located along the MC 48 road Areas located along the MC 48 road At confluence of Oucd Mdarrej and oucd Guemguem on MC48 road At intersection Oucd Sghir and the road of June 18th Serious flooding during rainy season due to presence of constructions in the river bed. Adjacent zones of Oucd Kebir between railway Important flooding due to the presence of a depressed zone in an agricultural area.		Akouda		
Areas located along the MC 48 road At confluence of Oued Mdarrej and oued Guemguem on MC 48 road At intersection Oued Sghir and the road of June 1 St Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a depresed zone in an agricultural area.	gans gang	Urban zone at intersection of Oued Kebir and MC 48 road	Important flooding problem during rainy events resulting from heavy deposits and flat river bed.	Relatively flat area requiring rehabitation of drainage works.
At confluence of Oued Mdarrej and oued Guemguean on MC48 road At intersection Oued Sghir and the road of June 1 St Adjacent zones of Oued Kebir between railway hidoe and entrance of Akonda	12.	Areas located along the MC 48 road Kala'a Khira	Temporary flooding problem caused by heavy run off flows from higher grounds.	Area with mild stopes surrounded by heavily urbanized zones and deprived of proper drainage facilities.
At intersection Oued Sghir and the road of June 1 St Serious Hooding due to the presence of constructions in the river bed. Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a depressed zone in an agricultural area.		confluence of Oucd Mdarrej and mguem on MC48 road	Serious flooding during rainy season due to presence of constructions and very shallow river bed.	Area with relatively flat slope requiring rehabilitation works of the existing river bed and drainage structure.
Adjacent zones of Oued Kebir between railway Important flooding due to the presence of a bridge and entrance of Akonda	<u> </u>	At intersection Oued Sghir and the road of June 1 St	the presence	Very flat area where river bed is flush with adjacent roads existing drianage is inadequate.
	15.	Adjacent zones of Oued Kebir between railway bridge and entrance of Akouda		Relatively flat area that needs improvment works for the evacuation of storm flows.

Source: DHU documentation Service

Table 4.7 PRESENT FLOOD PRONE LOCALITIES IN GREATER SOUSSE (3/3)

Kaltr 16. Zonc	Kala'a Sghira		
16. Zonc			
Bour	Zone located between the rail road and Ave H. Bourguiba	Serious flooding due to runoff flows from adjacent higher grounds with water level atteining 60 cm.	Area depressed with flat roads and deprived of any proper drainage facilities.
Msa	Msaken		
17. Soul	South side of the town along the road ta Ceinture	Temporarly flooded area due to the elevated road la Ceinture that obstructs runoff flows.	Area deprived of basic drainage infrastructure.
18. Arca GP1	Area adjacent to the bridge on Oued Melah and the GP1 road	important flooding problem due to existing constructions and narrow waterway under the existing bridge.	Area requiring improvement works of river bed to enhance drainage operation.
19. area Nori	area between Oued Djebli and the GP1 road on the North-West side of town	Serious flooding problem due to the construction of roads in the existing river bed.	Low area respect to adjacent grounds that required drainage facilities.

Source: DHU documentation Service.

Table 4.8 DISTRIBUTION OF SPONTANEOUS SETTLEMENTS IN GREATER SOUSSE

DELEGATION	HOUSING UNITS	LOCATION
- SOUSSE	400	Oued Kharroub/ Blibene, North-West of town between GP1 and Avenue 20 Mars.
- Hammam Sousse	22	Oued Hammam East of the intersection with the GP1 road.
- Akonda	40	Oued Laya (U/S of Oued Hammmam) South of the Avenue de la Republique.
- Kala'a kebira	25	Oued Sghir South side of town
- Kala' Sghira	<u>~</u>	Oued Laya west of RVE 819 road on the North side of town
- Msaken	20	Oued Melah (u/s of Oued Hamdoun) on the South-East side of town.

Source: Rehabilitation program of the 4 Oued in Greater Sousse, Nov. 1991

Table 4.9 FUTURE LAND USE COMPOSITION IN GREATER SOUSSE

					DELEC	DELEGATIONS				
LAND USE CATEGORY SOUSSE* Area (Ha)	SOUSSE* Arca (Ha)	HAMMAM SOUSSE Arca (Ha)	KALAA KBIRA Arca (Ha)	MSAKEN KALAA SGHIRA Area (Ha) Area (Ha)	KALAA SGHIRA Area (Ha)	AKOUDA Area (Ha)	AZ- ZOUHOUR Arca (Ha)	ZAOUIAT SOUSSE Area (Ha)	KSIBA Arca (Ha)	TOTAL Area (Ha)
URBAN AREAS	2595	1253	715	026	2	220	194	08	155	6592
AGRICULTURAL AREAS	380	1310	1950	5900	018	970	1525	590	528	13963
INDUSTRIAL AREAS	516	278	4	215	20	35	_	37	01	1186
GREEN AREAS	305	250	=3	300	34	99	& &	50	6.5	1218
TOTAL	3796	3091	2812	7385	1304	1291	1765	757	758	22959

1) Urban Development Plans of the Communities of Greater Sousse 2) Urban Development Master Plans of Sousse and Monastir - March 1993 Sources:

* Sousse + Sousse Riadh

Table 6.1 Summary of Existing Environmental Conditions in Greater Tunis (1/3)

River/Schkhet	Water Quality			Mediocre due to	some domestic	wastewater	discharge and	garbage in river.															Sebket is relatively	unpolluted; it	dries up completely	in summer					relatively clean	and unpolluted			_
Environmental problems				1. Spread of spontancous settlements in	middle and lower reaches.	2. Illegal and poorly constructed crossings	constructed by private means land culverts blocking river flow.	3. Garbage disposal in middle and	downstream reaches into river.	4. Erosion of roads due to problem of water	stagnation and flooding.	4. Lack of drainage system in S. Discharge of domestic waste water by	spontancous settlements into river.										General Development: Agricultural plaid Problem of Rooding in north 1. Rapid urbanization and loss of agricultural Sebket is relatively	land.	2. Spread of spontaneous settlements	especially in the Soukra area south and	south east of Sebkhet Ariana.	3. Landfill site in south east corner of the	Sebkhet is a source of pollution.	4. Some wintering birds - flamingoes seen;	Flooding problem controlled 1. Some garbage dumped into	the river.	2. Eutrophication of river bed.		
Problem of Flooding and				1. Europhication of river bed	with dense vegetation growth middle and lower reaches.	2. Crossings and culverts	constructed by private means	causing blockage or	preventing flow.	3. Garbage dumped into	river blocks flow.	4. Lack of drainage system in	Choultrana area.	5. No embankment or	pavement on road side;	road same elevation as	adjoining land.	6. The ONAS canal of	treated waste water as well	as topography of downstream	area makes drainage of river	into Schkhet Ariana difficult.	Problem of Rooding in north	part of the Sebkhet due to							Flooding problem controlled	with adequate flood control the river.	measures;		
Economic Development in River Basin	ş · į			General Development: Urban area	Upstream areas significant housing	-	area has scattered spontaneous housing;		development in the basin - both planned	and unplanned; Housing area in the	a!	Rood control measures such as dam,	lcn 1				-						General Development: Agricultural plain	of Soukra (protected agricultural zone)		extension plans in areas north of the	Sebkher; significant tourism development	is also taking place including many	hotels and a golf course in areas near	the sea and north east part of Sebkhet	Highly urbanised; planned scitlements;	planned urban settlements occuring in	Area: 18.87 km2 unstream areas with several flood control measures;	measures constructed.	
River or	Scokhet	Characteristics		Length: 21 km	Catchment	Area: 17.12 km2														-			arca: 33.73 km2	1							drains water of Length: 11 km	Catchment	Area: 18.87 km2		
Important		and/or	sins	Drainage	arca of areas	west of	Scokher	Ariana			:												Protected	agricultural	surrounding zone west of	Schkhei	Ariana				drains water of	urban areas	north west of	Tunis lake	
	Sebkhei			Oucd	Ennkhilet																		Schkhet	Ariana &	surrounding	arca					Oued	Greb			
ó				<u>-i</u>																			2								mi				

ole 6.1 Summary of Existing Environmental Conditions in Greater Tunis (2/3)

Oned	drains water of Leng	th: 21 km	General development: Highly urbanised	1. Garbage and waste water	1. Spread of spontaneous settlements.	River water
Gariana	Ì	ment		disposed into the river by	1	quality extremely
and its		arca: 86.52 km2		spontancous settiements.	to river. Oued garinna is a	poor due to
tributaries	Scbkhet			Many culverts and crossings virtual sewer.	virtual sewer.	domestic waste
	Sijoumi			are blocked.	3. Garbage thrown into river.	water discharges
					Very poor riverine landscape.	and garbage
						disposal
Schkhet	Acts like a	Area: 25.84 km2	Area: 25.84 km2 [General Development: urbanized in	Flooding problem in	1. Existence of about 30 discharge points	Sebkhel water
Siloumi	retrining basin Avg.	Avg. Depth:	north and north east part; agricultural	spontaneous settlement areas	spontaneous settlement areas of waste water along the banks of the	quality medioere
,	of draining		areas in western and southern areas of	in west part due to lack of	Schkhet. The largest part of these is	due to domestic
	waters of		the Sebkher. Sebkhet not used for		domestic waste water from the cities Essaida and industrial	and industrial
	surrounding		any nurrose: large part of it dries up in		El Manouba, Mellassine, Bir Aniba, Ezzouhi waste water	waste water
	arcas and		summer.		Sidi Hassinc Sijoumi, Fouchana, Meghira,	discharge
<u> </u>	Ored Gariana				El Ouardia and part of El Mourouj; Oued	
					Gariana and the tanneries of Manouba are	
					major sources of pollution; over 500 m3/d	
					of waste water flows into the Sebkhet.	
					2. Pollution problems caused by landfill at	
					Henchir El Yahoudia located in south east	
					part of take.	
					3. Eutrophication of Schkhet Sijoumi.	
Tunis North		arca: 26 km2	General development: surrounding areas	some flooding problems in the	General development: surrounding areas some flooding problems in the 1. The take is protected by contruction of a Lake water quality	Lake water quality
lake		Ave. Dooth: 60 cr	Depth; 60 criurbanised; the rehabilitation of the lake	Soukra area in spontaneous	Soukra area in spontancous canal along the west bank of the take	good:
			due to works carried out by ONAS has	sculements in the north east	against waste water discharges.	
			resulted in improvement in its quality;	part of the lake due to lack of	part of the lake due to lack of 2. Existence of some spontaneous housing	
			north-east part of the lake east of the	drainage facilities.	in the north east part of lake which lack	
			airport is being developed for urban		adequate drainage and sanitation facilities.	
			sculements; there afready exists a			
			shopping complex and road infrastructure			
			land use planning with adequate green		- Advantage of the second of t	
			areas being done			

Table 6.1 Summary of Existing Environmental Conditions in Greater Tunis (3/3)

Snoc siun	arca;	1	1. Some flooding problems	Water Pollution and lake cutrophication,	Extremely poor
Lake	avg. depth: 60 cm	moof major navigation port and related dock (temporary) in the Medina,	(temporary) in the Medina,	The south take of Tunis is heavily polluted	and a health
		facilities as well as the urban and indust. Fayette and Petite Sicily	Fayette and Petite Sicily	receiving 40,000 m3/d of waste water	hazard
		region of Ben Arous south of the lake.	municipality of Tunis city we	municipality of Tunis city wermostly industrial through drainage canals	
		. C. com.	of the lake due to low lying	coming from the Ben Arous area, The	
			flat lands in densely populated	flat lands in densely populated polluting industries spread all over the	
			areas.	Governorate of Ben Arous about 450 in	
			2. Temporary flooding proble	2. Temporary flooding proble number of which about 270 are in zones	
:			in the Port of Rades municip.	in the Port of Rades municip. managed by the AFT. The waste water	
			of Rades in eastern part of the	of Rades in eastern part of the discharges have resulted in currophication	
- 1			take due to the presence of	of the South lake and a total discoulibrium	
			depression and poor soil	of this water body.	
			conditions.		
Qued	length: 52 km	Major Development: Longest river of the	1. Major flooding problem	1. Increasing urbanisation and loss of	salinity problems
Maliyan	catchment	study area; catchment basin mainly	near mouth of river due to low agricultural lands.	agricultural lands,	and discharge of
and its	area: 1996 km2	agricultural with some industrial	lands in surrounding area.	2. Spread of spontaneous settlements in	domestic and
tributaries		development in downstream reaches	2. Isolated problems in	downstream areas in the governorate of	industrial waste
		in the governorate of Ben Arous.	Zaouiet Momag, Momag	Ben Arous.	water in down-
		Water of Oued Matiyan upstream of Bir	municipality, and some parts		Stream areas
		Mirchiga dam (primary purpose flood	of Ben Arous governorate		render classification
		protection) is used to a limited extent for due to spontaneous housing	due to spontaneous housing	making pollution control costly and difficult of water as	of water as
		irrigation; problem of excessive salinity o settlements obstructing the	settlements obstructing the	4. Water crosion: floods resulting from highl mediocre.	Imediocre.
		Maliyan limits its water use for irrigation natural drainage of the area	natural drainage of the area.	localised run-off over short periods have	
-	·			produced high levels of crosion (bank and	
				bed erosion).	
-				5. Water pollution by domestic and industrial	i.
				waste discharges in downstream reaches.	
				6. salinity of Oucd Maliyan preventing its	
				use even for irrigation	
.				7. Garbage dumped into river when flowing	
		A STATE OF THE STA		in urban sculements area.	
	- 1			8. Europhication and growth of dense	-
				vegetation in river bed blocking flow.	
Ored	legeth: 2 to 3 km	m Major development: unstream aceas	1. Soontaneous scitlements	1. Presence of spontaneous settlements.	Poor due to
Magzette,	catchment area:	1	2. Lack of drainage (acilities.	2. Lack of proper drainage and sanitation	domestic
Boukhamsa			3. Low lying coastal areas.	systems.	waste water
Ain Zcrga		Ezzahara and hammam Lif.	4. Lack of flood protection	3. Eutrophication of rivers.	discharges
			structures.		
			5. Eutrophication and		:
			dense vegetation growth		
			blocking flow.		

Table 6.2 Summary of Existing Environmental Conditions in Sousse Area (1/2)

Š.		Important	Riveror	Economic Development in River Basin Problem of Flooding and	- 1	Environmental problems	River/Sebkhet
	Sebkhet		Sebkhet		Causes		Water Quality
		and/or	Characteristics			And the state of t	
		Sub-basins				The state of the s	
	Oned		Length: 15 km	ē	 Occupancy of river bed & 	1. Rapid Urban Growth and the concurrence River water	River water
_	Наттат		Catchment	urbanized areas. Major towns are	drainage areas by the people of city-countryside.	of city-countryside.	quality very poor
			Area: 222 km2	Sousse		2. Spontaneous human settlements in	in downstream
				Kalaa Seghira. Main industry is olive		potential hazard zones (river bed and	areas of all major
				processing and leather goods production. 2. Lack of adequate or very	2. Lack of adequate or very	drainage watershed).	towns.
				and K. Kebira have predominantly textill	poorly maintained drainage	K. Kebira have predominantly textil poorly maintained drainage 3. Ill effects of rapid tourism development.	
				and leather manafacturing units.	infrastructures in urban areas.	infrastructures in urban areas 4. Ersion problems: layer and claw erosion.	
				Akouda and K. Seghira also have	3. Significant Eutrophication	3. Significant Eutrophication Erosion by wear and tear, bank erosion.	
					of river bed with dense	5. River Pollution by discharge of domestic	
				Coastal area well developed for tourism.	vegetation growth.	waste water into rivers from major urban	
				Limited coastal fishery.		areas and spontaneous settlements.	
						6. Very significant eutrophication of river	
						bed in many places blocking water flow and	
						creating water stagnation.	
						7. Coastal area pollution in prime beach	
<u> </u>						resort area by discharge of polluted rivers	
						into the sea.	
						8. Poor landscaping (riverine) especially in	
		**************************************				coastal tourist zone.	
						9. Garbage disposal heaps in river basin	
						and in river bed itself.	
_							-
2.	Oued	Collects	Length: 3.5 km	Highly urbanised; main industry is tourist 1. Significant eutrophication			River quality
	Blibane &	dranage water	-	in coastal zone.	of river beds with dense	2. Spontaneous settlements near river bed.	poor in upstream
	tributaries	of north part			vegetation growth obstructing	vegetation growth obstructing 3. Garbage disposal into river.	reaches, but
		of Sousse			flow.	4. Domestic waste water discharge by	improves with
		city			2. Poor maintenance of	spontaneous settlements into river.	natural purification
					existing infrastructure.	5. Significant eutrophication of river bed.	in touristic coastal
					3. garbage disposal in river	6. Poor riverine landscape.	zone.
					bed blocking flow.		

Table 6.2 Summary of Existing Environmental Conditions in Sousse Area (2/2)

ter Reches Souther Souther South Souther South Souther South South Souther South Souther South Souther South Souther South South South Souther South S	River/Sebkhet	Water Quality			or to	mediocre due to	waste water	discharge and	ugage disposed	into river.				River water	quality extremely	poor due to	domestic and	dustrial waste	discharges over	stretch of over	5 km upto the	.a.									-				
Reaches Scokhet Causes Scokhet Scokhet Causes Scokhet Sub-basins Characteristics Chara					. High Population density: 500-1000 p/km2 Pc	. Spontaneous settlements.		e water of			nto river.	5. Significant eutrophication.	7. Poor riverine landscape.					iver for a distance of 15 km until it reaches in	he sea. Further, the discharge of margines di	of over 70 olive processing units of M'saken a	is well as waste water from tannery units an 1.	lyeing units are major sources of pollution. se	2. Rapid urban growth and concurrence of	tity country side.	3. Some spontaneous settlements in river	drainage area.	 Significant eutrophication of river bed 	with dense vegetation growth causing	water stagnation in many places.	5. very poor riverine landscape.	5. garbage disposal heaps very near or in	he river at many places.	7. Erosion problems: layer and claw erosion,	erosion by wear and tear; bank erosion.	
or Important River or Eco Reaches Scokhet and/or Characteristics Sub-basins Sub-basins Southern Southern Carchment Sign Sub-basins South Sousse Catchment Sign South Sousse Index South Sousse South Sousse Index					1. Significant eutrophication. [1	 Garbage disposal into [2 					1)		1. Significant eutrophication of	niver bed with dense		enance.		3	3/	2)		3))				
or Important River or Reaches Sebkhet and/or Characteristics Sub-basins Characteristics Sub-basins Characteristics Sub-basins Catchment Ecngth: 2.5 km out part of Sousse Catchment Scity Area: 12.34 km2 aries Masken to acachment shakes from a catchment shakes from a catc	nomic Development in River Basin		The state of the s		ighly urbanised. A sweet manafacturing	it is present.										rban areas. Major towns include M'sake	ty and southern industrial areas of		ith around 70 units in M'saken.	anneries, textiles and some chemical	dustries also present.					- management of the state of th									
or Important Reaches and/or Sub-basins Southem Southem out part of Sousse s city aries Masaken to s Masaken to aries South Sousse South Sousse			Characteristics				Area: 12.34 km2											Š	3	T	ai														
Sebkhet Sebkhet Hamlouf Hamlou				Siris										drains water of	-		ઝ																		
No. 9. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.		Π			Oued	Hamiouf	and its	tributaries					-	Oned	Hamdoun	and its	mbutaries																		

Table 6.3 Result of Water Quality Analysis for Greater Tunis Area

sunny 22 3.64 sunny 24 6.08 sunny 24 6.55 sunny 25 2.55 sunny 27 4.6 sunny 27 7.35	Sampling Sampling	Weather	Ambient	0.0	Water Temp	Turbidity	Hd	Conductivity	s, solid	salinity	8	8
sunny 22 3.64 18.2 8 7.51 3.8 6.8 1.9 20 sunny 24 6.08 21.6 54 8.13 3.1 32 1.5 17 sunny 24 6.55 23.4 6.2 8.38 2.38 43.3 1.1 21 sunny 25 2.55 23.5 67 7.54 4.34 84 2.2 28 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 7.35 22.5 20.3 8.26 4.64 80 2.3 19	ate		Temp.	l/gm	O	İ.		ms/cm	I/6m	1/5	mg/l	mg/l
sunny 22 3.64 18.2 8 7.51 3.8 6.8 1.9 20 sunny 24 6.08 21.6 54 8.13 3.1 2.1 7.1 sunny 24 6.55 23.4 6.2 8.38 2.38 43.3 1.1 21 sunny 25 2.55 23.5 6.7 7.54 4.34 84 2.2 28 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.64 80 2.3 19	-											
Sunny 24 6.08 21.6 54 8.13 3.1 32 1.5 17 Sunny 24 6.55 23.4 62 8.38 2.38 43.3 1.1 21 Sunny 25 2.56 23.5 67 7.54 4.34 84 2.2 28 Sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 Sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	/4/93	sunny	22	3.64	18.2	80	7.51	3.8	6.8	1.9	20	30
sunny 24 6.08 21.6 54 8.13 3.1 32 1.5 17 sunny 24 6.55 23.4 6 28.38 2.38 43.3 1.1 21 21 21 21 21 21 21 21 21 21 21 22 28 48 48 48 19 <td< td=""><td>00 am</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	00 am											
sunny 24 6.55 23.4 62 8.38 2.38 43.3 1.1 21 sunny 25 2.55 23.5 67 7.54 4.34 84 2.2 28 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	/4/93	Sunny	24	6.08	21.6	54	8.13	3.1	32	1.5	17	71
sunny 24 6.55 23.4 62 8.38 2.38 43.3 1.1 21 sunny 25 2.55 23.5 67 7.54 4.34 84 2.2 28 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	30 am			7								
sunny 25 2.55 23.5 67 7.54 4.34 84 2.2 28 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.64 80 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	4/4/93	sunny	24	6.55	23.4	62	8.38	2.38	43.3	1.1	27	72
sunity 25 2.55 23.5 67 7.54 4.34 84 2.2 28 Sunity 27 4.6 22.5 67 7.54 4.34 84 2.2 28 Sunity 27 4.6 22.4 58 7.48 4.51 12 2.3 12 Sunity 27 6.68 26.6 60 8.4 4.39 110 2.2 65 Sunity 27 7.35 22.5 203 8.26 4.64 80 2.3 19	.00 am											
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sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	.35 am											111111111111111111111111111111111111111
sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	woll or											
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sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	no flow				-							
sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19											-	
sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	woll or											
sunny 27 4.6 22.4 58 7.48 4.51 12 2.3 12 sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19												
sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	4/4/93	sunny	27	4.6	22.4	58	7.48	4.51	12	2.3	12	32
sunny 27 6.68 26.6 60 8.4 4.39 110 2.2 65 sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	.10 pm		-									
sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	4/4/93	sunny	27	6.68	26.6	90	8.4	4.39	110	2.2	65	187
sunny 27 7.35 22.5 203 8.26 4.64 80 2.3 19	.50 am											
.35 pm	4/4/93		27	7.35	22.5	203	8.26	4.64	80	2.3	19	52
	.35 pm							•				
	-									•		

Table 6.4 Result of Water Quality Analysis for Sousse Area

Total coloform	MPN/100 ml	11000								1500		14000		2100				
8	mg/l	67		193		1185		1932		61		54	-	138			119	
800	l/gm	29		83		155		350		25		25		62			25	
salinity	1/5	4 4				1.2		0.7		4.2		1.6		3.4			0.67	
s. solid	l/bm	8.8		35.6		725		066		40		8.6		12			11.6	
Conductivity	ms/cm	7.97		2.21		2.54		1.6		7.55		3.32		6.54			11.9	
PH		7.49		7.75		8.42		7.35		8.03		7.45		7.76			7.82	
Turbidity	ULL	10		17		666 <		26		10		10		4			10	
Water Temp	ပ	19.7		20.9		22		23.6		19.6		16.4		14.4			26.7	
0.0	1/bm	6.76		4.92		3.91		6.52		8.45		4.4		7.13			4.2	
Ambient	Temp.	22		23		23		24		20		19		о			27	
Weather		sunny		sunny		sunny		sunny		sunny		sunny		sunny			sunny	
Sampling	Date	21/4/93	10.00 am	21/4/93	10.25 am	21/4/93	10.45 am	21/4/93	11.10 am	21/4/93	9.30 am	21/4/93	8.45 am	21/4/93	8.00 am	no flow	21/4/93	12.05 pm
Sampling	Point	-		2		3		4		9		9		2		8	6	

Table 6.5 Environmental Baseline Evaluation for Greater Tunis

The control of the	Environmental	Onco	1 Ennkhile	Tand Arian		Outd Lres #	1			100000000000000000000000000000000000000	1	See Inc.	Uation		sajeline Eva	Unition	1	Frinc PVB	uation	
Consider Project Consider Consid	brameters	UESC	ine typio	1100	15	Importance	Present	Page	mpor ance	Present	Į,	mportance	Present	Wilhout	Importance	Present	Without	Importance	resent	Without Transfer
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	ATURAL ENVIRONMENT											1				+				
### Control	round Phenomena					1		+		+								2		
1	Carthquake		+	1															+	
### Check Ch	Slope (alfure		_	1					_							1	1			
### Control of Parties of Cherical Parties of Parties by Rooding Parties of	Backwater Inundation								1			1				-			-	
## Street by Rooding Freesent Condition Rates by Rooding Freesent Condition Freese	Coastal Presion									-			-	2.	7	-		2	1	7.
## Second Condition ## Return	Stream Bed Erosion		7		-7	7	-	7.		-										,
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## 1	Soil Contamination		-									-						•		
1	drospheric Phenomena									+	1							_		
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6.7 Initial Environmental Examination for Greater Tunis (1/2)

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Table 6.7 Initial Environmental Examination for Greater Tunis (2/2)

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Stream Bed Erosion	-	-2	-		2	6	3	_	-5		2	2	2
Geology									:				
Soil Erosion	_	-5		2	2	2	2	-	-5	-	2	2	2
Hydrospheric Phenomena													
Groundwater													
Flow Regime (Water Balance)	2	-	-	2	2	2	2						
Flood	1	-5	-	2	2	3	3	1	-5	-	7	2	6.)
Water Quality													
Eutrophication	-	-5	1	2	2	2	2	1	-2		-		-
Turbid/Polluted water	-	-5		2	2	2	2	1	7-	,	1	-	# 2.
Dissolved Oxygen	1	-5	-	2	2	2	2	•	-5	-		•	-
Saltwater Intrusion	•	-5	×	×	×	×	×						
:													
SOCIAL ENVIRONMENT													
Human settlements													
Spontaneous settlements	-	-2	0	0	0	0	0	1	-2	0	٥	٥	0
Planned settlements	1	-5	-	-	2	2	2	-	-5		2	5	2
Industry	-				:								
Agriculture	2	2-	-	2	2	2	2		-				
Sanitary Condition													
Spread of water bome diseases	33	-2	-	2	2	7	2	et	?	-	2	2	2
Landscape													
Valuable Landscape or Scenary	2	-	-		-	-	-	~		-		-	

Present condition rating	iltionrating	Impactra	mpact rating (positive or negative)	
Rating	Criteria	Rating	Rating Criteria	
-	worse quality than 20 years ago	.+/-3	High significance	
2	almost same as 20 years ago	"+/-2	medium significance	
m	better quality than 20 years ago	1-/-1	low significance	
×	lack of data, further study necessary	×	impact not clear, further study necessary	
		0	no significant impact	

Table 6.8 Initial Environmental Examination for Sousse Area

Environmental	Ored Hammam	าเกลเก								Cued Hamdoun	goru				
Parameters	Baseline E	i	With Pro	ject						Baseline Evaluation	valuation	With Project	ect		
	Present Without	1	¥	IM2	TW3	HM 4	HM5	HM6	HM7	Present	Without	Ę	HD2	E E	<u>로</u>
	Condition	Project							:	Condition	Project				
NATURAL ENVIRONMENT															
Ground Phenomena															
Stream Bed Erosion	-	-2	-	2	2	2	7	2	3	v	-5		2	0	2
Geology															
Soil Erosion	-	-5	-	2	ત્ય	2	2	2	2	-	ç	۳	2	2	2
Hydrospheric Phenomena															
Flood	-	Ŋ	-	2	2	2	2	8	က	-	2		63	2	N
Water Quality															
Eutrophication	-	ç	-	8	2	2	2	2	2	+	2-	-	-	-	. I
Turbid/Polluted water	-	Ņ			-	-	-	•	-	-	-5	-5	-2	2	Ņ
Dissolved Oxygen	-	2	-	-		-			-	-	-2	-2	-5	-5	2
SOCIAL ENVIRONMENT														1	
Human Settlements											-				
Spontaneous Settlements	,	-5	2	-2	-2	-2	-2	2	2-	+	?	- -	-	7	T
Planned Settlements	•	-2	-	2	2	2	2	2	2	+	-5	,	2	8	8
Industry	٠														
Agriculture	-	-2	-		-	2	+	1	8	-	-5		2	2	2
Sanitary Condition															
Spread of Water Borne Diseas	က	-2	-	,-	-		↓	1	**	3	2	7	T	Τ,	7
Landscape															
Valuable Landscape or Scenar	Q	-5	-	-	-		-		_						

Rating

worse quality than 20 years ago Criteria

almost same as 20 years ago better quality than 20 years ago

lack of data, further study necessary

Criteria

medium significance high significance -1-1-+/-3

low significance

impact not clear, further study necessary

no significant impact

Table 7.1 Flood Inundation Area and Duration (1/3)

Return	Present Land U	Jse Condition	Future Land Use	Condition (2020)
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	26	1.5	32	2.5
2	64	4.0	78	7.0
5	108	6.5	132	11.5
10	157	10.0	191	17.0
25	210	13.5	256	22.5
50	267	16.5	324	28.5
100	326	20.5	396	35.0

Oued Greb

Return	Present Land U	Jse Condition	Future Land Use	Condition (2020)
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	6	4.0	21	6.0
2	12	5.0	30	8.0
5	22	6.5	59	10.5
10	34	8.0	82	12.5
25	69	10.5	114	17.0
50	90	13.0	139	21.0
100	112	16.5	159	22.0

Oued Gariana

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	58	4.0	106	7.0
2	94	7.0	171	11.5
5	125	9.0	228	15.5
10	153	11.0	278	19.0
25	179	13.0	326	22.0
50	204	15.0	370	25.0
100	227	16.5	412	28.0

Ouen manyan	·			
Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	30	1.5	30	1.5
2	130	2.0	130	2.0
5	800	5.0	800	5.0
10	2,630	14.0	2,630	14.0
25	4,210	20.0	4,210	20.0
50	6,070	28.0	6,070	28.0
100	7,300	35.0	7,300	35.0

Table 7.1 Flood Inundation Area and Duration (2/3)

Oued Mayzette

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	3	0.5	6	1.0
2	11	1.5	20	3.5
5	23	3.5	42	6.5
10	39	6.0	70	11.5
25	59	9.0	104	17.0
50	82	12.5	145	23.5
100	108	16.5	191	31.0

Oued Bou Khamsa

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	27	3.5	55	7.5
2	41	5.5	83	11.5
5	53	7.0	106	14.5
10	63	8.5	126	17.0
25	72	10.0	144	19.5
50	80	11.0	160	22.0
100	88	12.0	176	24.0

Oued Ain Zerga

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	2	0.5	3	1.0
2	5	1.0	7	2.0
5	9	2.0	12	4.0
10	14	3.0	18	5.5
25	18	4.0	25	7.5
50	24	5.0	32	9.5
100	29	6.0	39	12.0

Oued Hammam

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	20	3.5	23	4.5
2	50	8.5	59	11.0
5	86	15.0	102	18.5
10	127	22.0	150	27.5
25	171	30.0	203	37.5
50	219	38.0	260	48.0
100	270	47.0	320	59.0

Table 7.1 Flood Inundation Area and Duration (3/3)

Oued Blibene

Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	7	4.0	9	6.0
2	8	5.0	12	7.5
5	11	7.0	14	10.5
10	13	8.5	17	13.5
25	16	12.0	21	17.0
50	19	15.0	26	23.0
100	23	19.0	31	27.0

Oued Hallouf

Once Hanous				
Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	23	3.0	32	5.0
2	26	3.5	38	6.0
5	31	5.0	47	10.0
10	38	6.5	54	12.0
25	46	9.0	66	16.5
50	54	11.0	72	19.5
100	61	14.0	77	23.0

Oued Hamdoun

Caca Hamouni				
Return	Present Land Use Condition		Future Land Use Condition (2020)	
Period (yr)	Flood Area (ha)	Duration (hr)	Flood Area (ha)	Duration (hr)
1.05	138	10.0	144	11.0
2	151	12.5	159	15.0
5	172	17.0	181	19.0
10	192	21.5	206	25.0
25	222	29.5	237	35.0
50	244	37.0	261	41.5
100	277	48.0	293	52.0

Table 8.1 Unit Cost for Major Construction Work Items

Work Items	Unit	Unit Cost (DT)
1. River improvement		
1) Excavation, common	m3	5.0
2) Excavation, levee	m3	6.0
3) Backfill	m3	4.0
4) Concrete, Type A (240kg/cm2)	m3	80.0
5) Concrete, Type B (150kg/cm2)	m3	65.0
6) Reinforcement bar	ton	1000.0
7) Asphalt pavement	m2	2.5
8) Steel sheet pile	m2	230:0
9) Bridge RC-T	m2	850.0
10)Demolishing of structures	L.S.	
2. Construction of dam and retarding bas	<u>sin</u>	
1) Excavation, common	m3	5.0
2) Embankment	m3	7.0
3) Riprap	m3	20.0
4) Concrete, Type A (240kg/cm2)	m3	80.0
5) Concrete, Type B (150kg/cm2)	m3	65.0
6) Reinforcement bar	ton	1000.0
7) Sodding	m3	1.0
8) Curtain grout	ton	150.0
3. Tunnel construction	•	
1) Tunnel excavation	m3	80.0
2) lining concrete	m3	100.0
4. <u>Dredging/reclamation</u>		

Table 8.2 Construction Cost of Oued Ennkhilet

LICE SERVE (101 10 YT F1000)					Second Stage (for 100 yr Flood)					Total of Hrst and Second Stages				
Work Items	Unit	Unit Prior (DT)	Volume	Ameunt (DT)	Work Items	Umit C	Unit Price (DT)	Volume	Amount (DT)	Work berns	Chair	Unit Price (DT)	Volume	Amount (DT)
I Preparatory Works (3% of II & III)				020'959	I Preparatory Works (8% of II & III)				298,000	I Preparatory Works (8% of IL& III)				1,254,000
II River Inquovement			: -		Il River Improvement					II River Improvement			-	
1. Excavation, common	Ę	٧٠	201,400	1,007,000	1. Excavation, common	Ð	Vi	143,200	716,000	1. Excevation, common	Ë	ν.	344,600	1,723,000
2. Embankment, dike	Ę	9	68,100	408,600		12	9	60,300	361,800	2. Embariement, dike	E E	9	128,400	770,400
3. Backfill	E.	ব	48 900	195,600	3. Backfil	m3	4	67,800	271.200	3. Beckfill	en.	4	116,700	465,800
4. Structural concrete	5	ස	22,650	1,812,000		5	90	27.950	2,236,000	4. Structural concrete	Ę	80	50,600	4,048,000
5. Mady concerede	E	3	٥	<u>.</u>		E E	. 59	0	0	5. Mass concrete	ű	65	0	ō
6. Reinforcement seed bar	8	<u>8</u>	2,545	2,545,000	6. Reinforcement meel bar	tot	0001	2,916	2,916,000	6. Reinforcement steel bar	8	86	5,461	5,461,000
7. Asphalt povement	겉	2.5	2,145	5,363		겉	2.5	0	6		Ę	ม	2,145	5,363
8. Road bridge, RC-T	겉	820	918	780,300		Ë	850	0	0	8. Road bridge, RC-T	Ę	820	816	780,300
9. Railway bridge.	E	8000	0	0	9. Railway bridge	ä	2000	6	6	9. Railway bridge	E	2000	0	0
10. Other crossing facilities	L.S.	•		78,030	10. Other crossing facilities	S			0	10. Other crossing facilities	ز. ا			78,030
11. Demolish of existing attructure	Ē	30	4,740	142,200		£	30	٥	0	11. Demolish of existing structure	£	93	4,740	142,200
12. Miscellaneous works (15%)	7.		•	1,046,114	12. Miscellamous works (15%)	3.		•	975,150	12. Miscellaneous works (15%)	1.5	•		2,003,264
Sub-Total of II				8,020,000	Sub-Total of II			٠.	7,476,000	Sub-Total of II			÷	:5.496,000
III Dom & Reporting Stain			٠		III Durt & Releasing Bonin					III Dam & Contaction Dame				
	Ë	٠	95.25	25.250	-	ï	¥	•	4		٠ ٦	v	913	16.760
2 Embaskment dite	Ĩ		600	00,89	2 Respectively Consister	1	, ,) C	" CACHERONI CONTINUE	ì	٠ ١	200	207.57
3. Riprap	F	20	510	10200		Ê	. 50	o C		2 Biress	ï	. ç	¥ 5	10200
4. Structural concrete	E	80	98	27.200		Ê	2	, c		A National concess	ì	e c	3	27.200
5. Mass concrete	Ę	59	0			1	. S	٥	6	S Mana concepts]	\$ \$	2	i
6. Reinforcement steel bar	đ	1000	23	23,000	6. Reinforcement steel bar	ų.	1000	6	6	6. Reinforcement stoel bar	ě	901	2	23,000
7. Sodeling	24	_	1,020	020'1		115	-	٥	ô		겉	.1	020	0.00
S. Curtain Grout	-	150		ਠ		-	38	٥	0	8. Cartain Grout	100	ş	0	
9. Miscellancous works (\$5%)	្ប័	•	:	23,366	9. Miscellaneous works (15%)	S I		•	6	9. Miscellaneous works (15%)	T.S.		٠.	23,366
Sub-Total of III				179,000	Sub-Total of III				:	Sub-Total of III				179,000
Total of I to III				8,855,000	To I to late Total of I to III		٠.		8,074,000	Total of I to III				16,929,000
IV Land Acquisition and Compensation, 1. Land acquisition 2. Compensation	12	15	95,600	1,434,000	Land Acquisition and Compensation Land acquisition Compensation	5 G	202	23,500	358,500	IV Land Acquisition and Compensation 1. Land equisition 2. Compensation	F 7	200	2,400	1,792,500
Sub-Total of IV				1.914.000	Sub-Total of IV				359,000	Sub-Total of IV				2,273,000
V Engineering Services (10% Of I to III)				886,000	V Engineering Services (10% 0/1 to III)				807,000	V Engineering Services (10% 0f 1 to III)	~	-		1,693,000
VI Cov. Administration (5% of I to IV)				538,000	VI Gov. Administration (5% of 110 IV)				422,000	VI Gov. Administration (5% of I to IV)	•			000'096
VII Contingency (15% of I to VI)				1,829,000	VII Contagency (15% of Ito VI)				1,449,000	VII Contingency (15% of 1 to VI)		:		3,278,000
TOTAL				14,022,000	TOTAL				11,111,000	TOTAL				25,133,000

Table 8.3 Construction Cost of Oued Greb

Fire	First Stage (for 10 yr Flood)					Second Stage (for 100 yr Flood)			1		Total of First and Second Stages			
	Work Items	Uni	Undi Undi Price (DT)	Volume	Amount (DT)	Work Items	Unit	Unit Price (D'1)	Volume	Amount (DT)	Work Iterra	, <u>1</u>	Unit Price (DT)	Volume
а. ~	Preparatory Works (8% of 11 & III)				171,000	I Preparatory Works (8% of II & III)				398,000	I Preparatory Works (8% of II & III)			
E E	River Improvement					Il River Improvement					II River Improvement			
	 Excavation, continon 	5	'n	40,500	202,500	1. Excavation, common	Ę	'n	117,400	287,000	1. Excevation, common	£	₩.	157,930
	2. Embankment, dike	2	پ	10,000	90,000	2. Erribantement, dite	Ę	٠	0	6	2. Embanizment, dike	Ę	vo	10,000
	3. Backfill	Ę,	-	20,200	80,800	3. Backfill	Ę	₩.	33,500	134,000	3. Backfilt	Ē	4	53,700
_,	4. Structural concrete	5 7	£ ;	6,480	518,400	4. Structural concrete	£,	£ ;	22,230	1,778,400	4. Structural concrete	J.	\$	28,710
	5. Makes concrete 6. Rein forcement about her	5 5	£ 5	٠ <u>۶</u>	00000	5, Mass concrete	E .	S 5	0 6	0 55		B	\$6:	0
.,	7 Ambalt revernent	i c	3 2	χ _Ε	0000000	5. Keinlordennin med bar	E 1	Š	7 60	1,002,000	6. Reinforcement steel bar	ğ '	80	2,7,7
	8. Road bridge, RC-T	1	88	3	3	S Boad bardes ROT	Ę	5	ş	200.1	Apparet pavement	2 1	<u>.</u>	99
	9. Railway bridge	6	808	0	0	9. Railway bridge	ŧ E	8	30	0	O Reifwey bridge	Ę	£ \$	ş
•	10. Other crossing facilities	LS	•		0	10. Other crossing facilities	Ľ			8.100	10. Other coasing facilities	2	3	
	11. Demolish of existing structure	Ę	20	2. 2.	76,200	11. Demolish of existing structure	Ē	30	2,740	82,200	11. Demolish of existing structure	3 8	. <u>ş</u>	. 280
	12. Miscellaneous works (15%)	ĽS			220,260	12. Minoellancous works (15%)	Ŋ	•	•	648,105	12. Miscellareous works (15%)	Z.	٠.	
	Sub-Total of II				000'689'1	Sub-Total of I.				4,969,000	Sub-Total of II			
B	Dan & Retarding Basin				·	III Our & Reporter Basin					The Parent Posterior			
	1. Excavation, common	£	٠,	60,800	304,000		Ē	₩3	0	0		ĩ		om 05
	2. Embandement, dike	E	7	5,700	39,900	2. Embankment, dibe	Ē	۴	0	6	2 Embasionent die	3 2	, -	\$ 200
	3. Riprap	Ē	20	510	10,200	3. Riprap	E	20	0	6	3. Riprap	E CE	2	510
	4. Structural concrete	3	80	213	22,000	4. Structural concrete	5	8	0	5	4. Structural concrete	E	80	275
	5. Mass concrete	Ē	Ş	0 ;	5	5. Mass concrete	Ē	\$	0	8	3. Mana concrete	Ė	\$3	o
	o. Reniorement free our	8	<u> </u>	82 5	18,000	6. Reinforcentent steel bar	e e	8	5	6	6. Reinforcement steel bar	ê	000	90
	A Certain Group	i -	- 5	020,1	020	7. Sodding	Ę.	- Ş	0 (0	7. Sodding	7	,	020'1
	9. Miscellancous works (15%)	. vi	·		59.268	9. Minordianous works (15%)		₹.		5 6	8. Curium Circuit		<u>2</u>	0
				٠			i			}	(or (1) and on a posterior of	į		•
	Sub-Total of III				454,000	Sub-Total of III				6	Sub-Total of III			
	Total of I to III			:	2,314,000	Total of I to III		-		5,367,000	Total of I to III			
2 .	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	겉겁	50 200 200 200 200 200 200 200 200 200 2	21,000	1,470,000	IV Land Acquisition and Compensation 1. Land acquisition 2. Commensation	달 달	0.00	18,000	1,269,000	IV Land Acquisition and Compensation Land acquisition	2 7	5 5	39,000
	Sub-Total of IV				1,670,000	Sub-Tecal of IV				1 460 000	VI be lead Ans	1	3	7
ž >	V Premering Services (10% Of to III)			é	337 000	The state of the s	ے							
					2001		-		٠,	000/20	V Engineering Services (10% Of 1 to III)	e e		
ڻ 5	V. Gov. Administration (5% of 1 to IV)			-	199,000	VI Gov. Administration (5% of I to IV)				341,000	VI Gov. Administration (5% of I to IV)			
Ę.	VII Contingency (15% of I to VI)				662,000	VII Contingency (15% of I to VI)				1,156,000	VII Contingency (15% of I to VI)			
	TOTAL				5,076,000	TOTAL		٠		8,361,000	TOTAL			

39,900 39,900 10,200 22,600 18,000 1,010 1

7,680,000

2,730,000

3,130,000

541,000

789,500 60,000 214,800 2,296,800 2,212,000 1,500 51,000 51,000 51,000 158,400 158,400 168,460

Table 8.4 Construction Cost of Oued Gariana

First Stage (for 10 yr Flood)					Second Stage (for 100 yr Flood)					Total of First and Second Stages				
Work Jems	Umit	Unt UntProc	Volume	Arrount	Work Items	Unit Unit Price	ni Prioc	Volume	Amount	Work Items	Unit	Unit Price	Volume	Amount
		6		(tg)			(<u>G</u>)		Œ			ē		6
Preparatory Works (8% of II & III)				2 923 000	I Preparatory Works (8% of II & III)		•		1.165.000	I Preparatory Works (8% of II & III)				4,088,000
II River Improvement	* 1	,			II River Improvement		:			II River Improvement			:	
1. Excavation, common	Ę	vo ·	423,000	2,115,000	I. Excavation, common	Ë	v n	401,000	2,005,000	 Ехсауароп, сопятоп 	Ē	vi :	824,000	4,120,000
2. Embankment, dike	E.	.	0	ਠ	2. Embankment, dike	m3	\	G	6	2. Embankment, dike	E .	v a -	o	8
O Garcenson	Ę,	₩ ;	285,000	140 000	3. Backfill	E .	4	3,500	14,000	3. Backfill	ខ្លួ	₹	288,500	1.1
4. Structural concrete	e .	<u> </u>	92,200	7,376,000	4. Structural concrete	E '	S ;	70,800	5,664,000	4. Stractural concrete	E .	8 ;	163,000	13,040,000
S. Mass concrete	2	69	0	Ö	5. Mass concrete	m3	65	0	6	5. Mass concrete	E	ŝ	0	5
6. Reinforcement steel bar	8	000	6,460	6,460,000	6. Reinforcement street ber	E0:	1000	4,980	4,960,000	6. Reinforcement stori bar	Lon	200	11,420	11,420,000
7. Asphalt peversent	결	2.5	19,100	47,750	7. Asphalt pavement	겉	2.5	0	6	7. Asphalt povement	Ę	2.5	19,100	47.750
S. Road bridge, RC-T	겉	8	9,540	8,109,000	8. Road bridge, RC-T	겉	850	ō	0	8. Road bridge, RC-T	Ę	850	5 5 5 5	8,109,000
9. Railway bridge	6	2000	<u>.</u>	75,000	9. Railway bridge	E	800	0	Ó	9. Railway bridge	E	2000	15	75,000
10. Other crossing facilities	LS	,		810,900	10. Other crossing facilities	ŗ.		•	ਠ	10. Other crossing facilities	ĽS	,	•	810,900
11. Demoish of existing structure	m3	30	29,630	200,500	11. Demolish of eximing structure	£	30	250	22,500	11. Demolish of existing structure	Ê	Я	30,400	912,000
12. Miscellascous works (15%)	I.S.	•		4,053,473	12. Miscellaneous works (15%)	ĽŠ			1,899,825	12. Miscellarcous works (15%)	Š		¥,	5,953,298
														
Sub-Total of II				31 077 000	Sub-Total of II				14,565,000	Saly Total of II				45,642,000
III Darn & Retarding Basin			•		III Dam & Retarding Bann					III Dom & Retarding Bases				
	Ę	S	607,500	3.037.500		E E	*	0			Ê	4 7	607.500	3.037,500
2. Embankment, dike	E		159.900	1119 300	2. Probackment dike	Ë			· c	2 Perhapherens dite	ï		9	00% 6111
3, Riprap	Elli Elli	50	800	196 CO	3. Rices	É	20	c	c	3 Riveo	É	S	9 800	196 000
4. Structural concrete:	Er.	80	2,510	200,800	A. Structural congrete	1	8	0	6	4. Spacing connet	É	8	2.510	200,300
5. Mass concrete	E.	65	0	©.	5. Mass concrete	Ë	\$	0	6	5. Mass concrete	Ē	\$9	0	Ö
6. Reinforcement suce bar	: uo	1000	176	176,000	6. Reinforcement steel bar	fon	1000	0	0	6. Reinforcement ateet bur	io	1000	176	176,000
7. Sodding	겉	-	19,700	19,700	7. Sodding	<u>m</u>	_	0	6	7. Sodding	E		19,700	19.700
8. Curtain Grout	-4	8	0	5	B. Curbin Grout		8	0	.	8. Curtain Grout	-	8	0	ਨ
9. Miscellaneous works (15%)	2.5			712,395	9. Misocilaneous works (15%)	Ľ		•	5	9. Miscellaneous works (15%)	Ľ		,	712,395
Sub-Tead of III				5,462,000	Sub-Total of III					Sab-Total of III		٠		5,462,000
	٠			:										
Total of 1 to III				39,462,000	Total of I to III				15,730,000	Total of I to III				55,192,000
IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	2 3	26.27	372,000	9,772,440	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	2 2	200	148,000	7,400,000	IV Lend Acquisition and Compensation 1. Land acquirition 2. Compensation	E 25	33.023 200	\$20,000 30,000	17,171,960
Sub-Total of IV				12,812,000	Sub-Total of IV	٠			10,360,000	Sub-Total of IV				23,172,000
V Engineering Services (10% of I to III)				3,946,000	V Engineering Services (10% of 1 to III)	_			1,573,000	V Engineering Services (10% of I to III)	_		ć	\$519,000
VI Gov. Administration (5% of 1 to IV)	4.			2,614,000	VI Gov. Administration (5% of 1 to IV)	٠			1,304,000	VI Gov. Administration (5% of I to IV)				3,918,000
VII Contingency (15% of I to VI)				8,825,000	VII Contingency (15% of 1 to VI)	•		•	4,345,000	VII Contingency (15% of 1 to VI)		•		13,170,000
TOTAL				67,659,000	TOTAL				33,312,000	TOTAL				100,971,000

Table 8.5 Construction Cost of Oued Maliyan

Flood)			yr Flood)			Total of First and Second Stages			
Work liems Un	Unit Unit Price Volume (DT)	Amount (DT)	Work Items Unit Unit Price Volume (DT)		Amount (DT)	Work Items	Unit Unit Price (DT)	ce Volume	Amount (DT)
1 Preparatory Works (8% of II & III)		000'590'1	I Preparatory Works (8% of II & III)		330,000	1 Preparatory Works (8% of 11 & III)	6		1,395,000
			II River Improvement			Il River Improvement			
e c		4,635,000	м m3		1,953,000	I. Excavation, common	m3	5 1,317,600	6.588,000
ent, dike	6 284,600	1,707,600	ment, dike m3	272,400	1,634,400	2. Embankment, dike	m3	6 557,000	3,342,000
	4 2	0 (E .	0	0	3. Backfill		0	0
A Marie concrete	080	0 (rete m3	\$	0	4. Structural concrete			6
teel bar	1000		5. Mass concrete A Dainformant class har for 1000	> 0			•		0
	•	2,500	Asphalt navement m?	> C	- c	7 Action	_		0
	850	1,700,000	r m2		00	8. Road bridge, RC-T	m2 2.5	2000	200,000
Railway bridge	2,000 0	0	Railway bridge	0	0	9. Railway bridge	N)		0
10. Other crossing facilities L.S.	•	170,000	Other crossing facilities L.S.	1	0	Ξ.		,	170.000
11. Demolish of existing structure m3	3 30 2,500	75,000	Demolish of existing structure	0	0		m3	30 2,500	75,000
12. Miscellaneous Works (15%) L.3	, ,	1,244,000	12. Miscellancous works (15%) L.S.	•	238,000	12. Miscellaneous works (15%)	L.S.	•	1,782,000
Sub-Total of II		9,540,000	Sub-Total of II	•	4,126,000	Sub-Total of II			13,665,000
III Hamma Dam (Allocated Cost) *		3,769,000	III Hamma Dam (Allocated Cost)	•	0	III Hamma Dam (Allocated Cost)	٠	٠	3,769,000
Total of I to III		14,374,000	Total of I to Ill	•	4,456,000	Total of I to III			18,829,000
IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation m2	2 1 920,600 2 260 1,780	920,000	IV Land Acquisition and Compensation 1. Land acquisition m2 1 2. Compensation m2 200	162,000	162,000	Land Acquisition and Compensation Land acquisition Compensation Compensation	22 2	1 1,082,000	1,082,000
Sub-Total of IV	÷	1,276,000	Sub-Total of IV		162,000	Sub-Total of IV			1,438,000
V Engineering Services (10% of I to III)		1,437,000	V Engineering Services (10% of I to III)		446,000	V Engineering Services (10% of I to III)	· (III		1,883,000
VI Gov. Administration (5% of I to IV)		783,000	VI Gov. Administration (5% of I to IV)		231,000	VI Gov. Administration (5% of 1 to IV)	S		1,014,000
VII Contingency (15% of 1 to VI)		2,681,000	VII Contingency (15% of I to VI)		794,000	VII Contingency (15% of I to VI)			3,475,000
TOTAL		20,551,000	TOTAL		6,088,000	TOTAL			26,639,000
					-				-

Note *: Construction cost and land acquisition cost of Hamma Dam was estimated in the report of "BARRAGE SUR L'OUED EL HAMMA ; ETUDE D'AVANT . PROJET, MOA, April 1990".

The cost is up-dated taking trend of consumer prices of recent 5 years into consideration and is allocated to flood control purpose.

Table 8.6 Construction Cost of Oued Mayzette

Flood)		:	Second Stage (for 100 yr Flood)			Total of First and Second Stages			
Work Items Unit Unit Pri	Unit Unit Price Volume	Amount	Work Items Unit Unit	Unit Unit Price Volume	Amount	Work flems	Unit Unit Price Volume	ice Volume	Amount
			2						3
1 Preparatory Works (8% of 11 & 111)		211,000	1 Preparatory Works (8% of II & III)		198,000	I Preparatory Works (8% of II & III)			409,000
Il River Improvement			II River Improvement		<u></u>	Il River Improvement	-		
Excavation, common	\$ 80,000	400,000	1. Excavation, common m3	5 70,500	352,500	1. Excavation, common	m3	5 150,500	752,500
2. Embankment, dike m3	6 22,100	132,600	2. Embankment, dike m3	6 5,500	33,000	2. Embankment, dike	m3	6 27,500	165,600 {
Backfill	_	67,600	Backfill	_	009'29	3. Backfill	m3	•	135,200
rete	7.4	592,000	Structural concrete	80 7,400	592,000	4. Structural concrete		80 14,800	1.184.000
m3		0	5. Mass concrete m3		0	5. Mass concrete	.m3	65 0	ō
el bar ton		280,000	Reinforcement steel bar		280,000	6. Reinforcement steel bar	1,000	-	1,160,000
m2		975	7. Asphalt pavement m2	2.5 390	576	7. Asphalt pavement	m2	2.5 780	1,950
Road bridge, RC-T m2	850 560	476,000	Road bridge, RC-T m2	850 560	476,000	8. Road bridge, RC-T	m2 8	850 1.120	952,000
Ħ	5,000	<u>-</u>	Railway bridge m	5,000 0	0	9. Railway bridge	m 5,000	9	o
		48,000	Other crossing facilities	•	48,000	10. Other crossing facilities	L.S.	١.	006.96
٤	30	0	Demolish of existing structure	30	0	11. Demofish of existing structure	e Se	30 0	0
12. Miscellaneous works (15%) L.S.	•	345,000	12. Miscellaneous works (15%) L.S.		323,000	12. Miscellaneous works (15%)	L.S.		668,000
12 0 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		000000	i i						
Out- total of it	ŧ	2,042,000	Sub-Total of II		2,473,000	Sub-Total of II			5,113,000
III Dam & Retarding Basin	٠.		III Dam & Retarding Basin			III Dam & Retarding Basin			
1. Excavation, common m3	•	0	1. Excavation, common m3		0		. E	5 0	0
2. Embankment, dike m3	7 0	0	Embankment, dike	7 0	0	2. Embankment, dike	m3	7 0	Ö
3. Riprap m3	20 0	0	3. Riprap m3		¢	3. Riprap			o
rrete	80 0	0	4. Structural concrete m3	0 08	0	4. Structural concrete		-	0
m3		-	5. Mass concrete m3	65 0	0	5. Mass concrete	m3	65 0	0
ement steel bar	0,000	0	ement steel bar	1,000	0	6. Reinforcement steel bar		000,1	0
m ²	0	0	Sodding		Ó	7. Sodding	. ш2		0
·	150	<u>.</u>		150 0	0	8. Curtain Grout		150 0	Ġ.
9. Miscellaneous Works (15%) L.S.	•	-	9. Miscellaneous works (15%) L.S.		6	9. Miscellaneous works (15%)			0
Sub-Total of III		0	Sub-Total of III		0	Sub-Total of III			0
Total of I to III		2,853,000	Total of I to III		2,671,000	Total of I to III			5.524,000
		-							
IV Land Acquisition and Compensation 1. Land acquisition m2 2. Compensation m2	15 15,500 200 500	232,500	IV Land Acquisition and Compensation 1. Land acquisition m2 2. Compensation m2	15 15,500	232,500	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	. 2. 2.	15 31,000 200 1,000	465,000
Sub-Total of IV		333,000	Sub-Total of IV		333,000	Sub-Total of IV			965,000
V Engineering Services (10% of 1 to III)		285,000	V Engineering Services (10% of 1 to III)		267,000	V Engineering Services (10% of I to III)	(H		552,000
VI Gov. Administration (5% of I to IV)		159,000	VI Gov. Administration (5% of I to IV)		150,000	VI Gov. Administration (5% of 1 to IV)	ક		309,000
VII Contingency (15% of 1 to VI)		545,000	VII Centingency (15% of I to VI)		512,000	VII Contingency (15% of I to Vf)			1,058,000
TOTAL		4,175,000	TOTAL	•	3,933,000	TOTAL	-		8,108,000
								-	

Table 8.7 Construction Cost of Oued Bou Khamsa

m3 5 m3 6 m3 6 m3 65 ton 1,000 m2 2.5 m 5,000 L.S.	51,300 0						_				e C
Excavation, common m3 5	51,300	198,000	1 Preparatory Works (8% of 11 & 111)			177,000	L	Preparatory Works (8% of 11 & 11!)			275,000
1. Excharation, common m3 5 2. Embankinent, dike m3 6 3. Backfill m3 4 4. Structural concrete m3 80 5. Mass concrete m3 65 6. Reinforcement steel bar ton 1,000 7. Asphalt pavement m2 2.5 8. Road bridge, RC-T m2 850 9. Railway bridge m 5,000 10. Other crossing facilities L.S.	51,300 0									٠	
m3 6 m3 4 m3 80 m3 65 ar ton 1,000 m2 2,5 m3 5,000 es L.S	0	266 500	ii Kive improvenem	É	21.52		= = 			40,	
m3 4 m3 80 m3 65 ton 1,000 m2 2.5 m 5,000 L.S.	>	000,000	2. Externion, Common	5.00	91,10	000,000	<u>.</u>			102,400	512,500
m3 65 foot 1,000 m2 2.5 m2 850 m2 850 m 5,000 L.S.	20.700	008 28)	20400	20740	2 Backett			0 0	9
m3 ton 1,6 m2 n,6 L m 5,6	8.400	000,579				`	· ·	ż		41,100	104,400
ton 1 m2 m2 m 5 L.S.	200	000'-		î E				זבוכ		10,801	5.00 5.00 5.00 5.00
	8	200	A Deinforcement stead box				٠ . 			0 ;	0
m2 rn 5 L.S.	20,5	03601	7 Acadest acceptant	4	r		9 1	ei car	,î	008	900,008,
L.S.	97.	00001	o part hiter DO 7		M/', 030		~ 0			15,400	38,500
L.S.	2 5	00,40	o. Road Gridge, K1		,		× (140	119,000
	11	32,500	9. Kaliway onloge		OON'C))	o :		2,000	17	82,500
í	, 6	00.7	10. Outer crossing facilities		. `	φ·,		_		1	12,000
Ē.	097	8,400	11. Demoish,of existing structure		2	0		6	3 30	280	8,400
12. Miscellancous works (15%) L.S.		323,000	12. Miscellaneous works (15%)	L'S		290,000		Miscellaneous works (15%) L.S.	Š	ı	612,000
Sub-Total of II		2,475,000	Sub-Total of II		-	2,218,000	Sub-Total of II	Hjc			4,693,000
III Dan & Refarding Barin		- "	THE Present the Description of the Present								
	ď	. (ָרָאָבָּין בּי	•	•	•	Ω = -				
Ę	-	Ģ (EE.	ומצ	0	-i		3 5	0	0
ment, dike m3	0	0		m3			. 2		3 7	o	Ü
ži.	0 1	0		m3	02		ж. 		3 20	O	_
	0	Ó		m3			4			٥	
	: •	0	5. Mass concrete			0	٠.	rete m3		0	0
ement steel bar	.	3	6. Reinforcement steel bar	_	000.		9	Reinforcement steel bar ton	1,000	0	_
711	9	0		~1		0		m2	2	0	
6. Curram Grout 150	٥,	0			150	0	∞i) ino	150	6	•
y. Miscellaneous works (15%) L.S.	•	0	9. Miscellaneous works (15%)	L.S.		0	<u>ح</u>	Miscellaneous works (15%) L.S	Š	•	Ü
Sub-Total of III		0	Sub-Total of III			0	Sub-Total of III	, III			
											,
Total of I to III	**	2,673,000	Total of I to III			2,395,000	Total of I to III				5,068,000
Compensation	:			E				W Land Acquisition and Compensation			
2. Compensation m2 15	6,400 1,000	200,000	Land acquisition Compensation	#2 E	200 1 000	08,000 08,000	1. Land acquisition	isition m2	2 15	12,800	192,000
		-								7007	3
Sub-Total of IV		296,000	Sub-Total of IV			296,000		Sub-Total of IV			592,000
V Engineering Services (10% of 1 to III)		267,000	V Engineering Services (10% of 1 to 111)	í í		240,000		V Engineering Services (10% of I to III)			507,000
VI Goy Administration (5% of I to 7A)		248.000	VI COM A description of the State of the Sta		٠,			. i			
		70,00	VI COV. Administration (5% of 1 to 1V)			135,000		VI Gov. Administration (5% of I to IV)			283,000
VII Contingency (15% of l to VI)		208,000	VII Contingency (15% of I to VI)	٠		460,000	VII Contingency (15% of 1 to VI)	5% of I to VI)			968,000
TOTAL	:	3,892,000	TOTAL			3,526,000		TOTAL			7.418,000

Table 8.8 Construction Cost of Oued Ain Zerga

First Stage (for 10 yr Flood)				Second Stage (for 100 yr Flood)			- 1		Total of First and Second Stages		
Work Items Uni	Unit Unit Price Volume	Volume	Amount	Work Items	Cait Cai	Unit Unit Price Volume		Amount	Work Items Unit Unit Price Volume	Volume	Amount
	6		(1)			(10)		<u> </u>	(IQ)		(10)
I Preparatory Works (8% of II & III)			131,000	I Preparatory Works (8% of II & III)				121,000	I Preparatory Works (8% of II & III)		252,000
Il Biver Improvement			 -	11 Dive Improvement					11 Divise Insertite and		
	***	29.700	148 500		3	5	32.400	162 000	1 Freezestion common m3 c	63 100	150 400
		2	0		É			200	· · ·		Ċ
	. 4	9.200	36,800		e E	4	14,600	58,400	m3 4	23.800	95.200
4. Structural concrete m3	9)	1,500	120,000		E		7.200	576,000	al concrete m3 80	8,700	000'969
		0	0		E CE		0	0	É	0	0
6. Reinfortement steel bar ton	1,000	120	120,000	6. Reinforcement steel bar	ton	000	250	520,000	steel bar ton 1.0	640	640,000
-		1,100	2,750	7. Asphah pavement	m2	2.5	0	0	Asphalt payement m2	1.100	2.750
_		× 0	459,000	8. Road bridge, RC-T	#2 #2	820	0	0	fu.	3	459,000
	8	*	70,000	9. Railway bridge	E	2,000	0	- c	·	4	70,000
acilities			46,000	10. Other crossing facilities	2		, : ,	Ó	Other crossing facilities 1S.	. ,	46.000
ucture	30	Ş	200	11 Denolish of existing structure		ç	c	· c	Demolish of existing structure m3	ç	200
		2 .	150 700	12 Miscellaneous works (15%)	_	3 :	, ,	107 500		ζ,	248 200
			20/1021		į	1		200	Indecidences work (17.0)	•	9
Sub-Total of II			1,156,000	Sub-Total of II			744	1,514,000	Sub-Total of H		2,670,000
				t							ته لدنه
	٠	ţ	-	III Dam & Relarding Basin	•	1	,				
Excavation, common	n	7.100	35,500	1. Excavation, common	Ê	'n	0	0	na m3 S	7,100	35,500
ment, dike		31,300	219,100	2. Embankment, dike	m 3		0	0	7	31,300	219.100
		1,100	22,000	3. Riprap	m3	20	0	0		1.100	22,000
rete	80	Š	40,000	4. Structural concrete	2	8	0	0	4. Structural concrete m3 80	8	40,000
5. Mass concrete m3	\$ 65	0	0	5. Mass concrete	E E	65	0	0	E E	0	
6. Reinforcement steel bar ton	3,000	9	40,000	6. Reinforcement steel bar	ton	1.000	0	0		94	40.000
7. Sodding m2		2.100	2,100	7. Sodding	m2	-	0	•	Sortding	2.100	2,100
irout	150	370	55.500	8. Curtain Grout	-	200	9	- c	Trout	370	\$5.500
works (15%) 1			62,200	9. Miscellaneous works (15%)	LS.			0	Miscellaneous works (15%) L.S.		62,200
											<u></u> x
Sub-Total of III			477,000	Sub-Total of III				0	Sub-Total of III		477,000
,											
Total of I to III			1,764,000	Total of I to III			-	1,635,000	Total of I to III		3,399,000
IV Land Acquisition and Compensation				IV Land Acquisition and Compensation	g				IV Land Acquisition and Compensation		
Ę	30	9,600	000'861	I. Land acquisition	m2	33	400	12,000	1. Land acquisition m2 30	7,000	210,000
2. Compensation rn2		0	0	2. Compensation	m7	200	0	0	2. Compensation m2 200	•>	0
Sub-Total of IV			198.000	Sub-Total of IV				12,000	VI jo jator diež		230 000
								-			1
V Engineering Services (10% of I to III)			177,000	V Engineering Services (10% of 1 to III)	E			163,000	V Engineering Services (10% of I to III)		340,000
VI Gov. Administration (5% of I to IV)			000'66	VI Gov. Administration (5% of I to IV)	_			82,000	VI Gov. Administration (5% of 1 to IV)		181,000
VII Contingency (15% of 1 to VI)			336,000	VII Contingency (15% of I to VI)				284,000	VII Contingency (15% of 1 to VI)		620,000
I & HOSE			263%	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1			•				
TVIO			3/4,000				7	2,1 76,900	TOTAL		4,750,000

Table 8.9 Construction Cost of Oued Hammam

Work items	Unit Unit Price Volume (DT)	e Volume	Amount (DT)	Work Items	Unit Unit Price Volume (DT)	rice Volum)	te Amount (DT)	ii c	Work Items	Unit U	Unit Unit Price V	Volume	Amount (DT)
I Preparatory Works (8% of II & III)			333,000	1 Preparatory Works (8% of II & III)			8	30,000	I Preparatory Works (8% of II & III)	:			363,000
Il River Improvement				Il River Improvement					II River Improvement		•		
 Excavation, common 	m3	5 218,500	1,092,500	1. Excavation, common	m3	3	0	0		E 13		218.500	1.092.500
2. Embankment, dike	m3	5 26,200	157,200		m3	54,000		324.000	2. Embankment dike	· •	' 've	80,200	481 200
3. Backfill	m3 4	0	-	3. Backfill	m3	-		0	3. Backfill	3		0	
4. Structural concrete	тэ 80	0	0	4. Structural concrete		80		0	4. Strictural concrete	. e	8	· c	
5. Mass concrete	m3 65	0	0	5. Mass concrete			0	•	5. Mass concrete	i E	8 82	Ç	
6. Reinforcement steet bar		٥	C	6. Reinforcement steel bar) [G	C	6 Reinfornement steel har	} {	8) c	
7. Asphalt pavement		5.000	12.500	7. Asphalt pavement					7 Asphalt pavement	: F	,	\$	20.50
8. Road bridge, RC-T			2 125,000	8. Road bridge, RC-T				0	8 Road bridge RC.T	. C	}	200	2 125 000
9. Railway bridge	ς,		0	9. Railway bridge	**		. 0	. 0		<u> </u>	8 5	2	4,144,2
acilities	٠,		213.000	10. Other crossing facilities		•		0			3	> ,	212 (00)
cture	m3 30	200	15.000	11. Demolish of existing structure		30	0	0	11 Demolish of existing structure	į į	5	ξ	200,1
	L.S.		542,300	12. Miscellaneous works (15%)			48	48,600	12. Miscellaneous works (15%)	L.S.	٠.	?	290,900
Electrical Ass			000										٠
Control of Its			4.156,000	Sub-10tal of 13			5/S	3/3,000	Sub-Total of II				4,531,000
III Dam & Retarding Basin		-		III Dam & Retarding Basin		-			III Does & Wednesding Beat.				
1 Fresvation common	,					v			á	•	,	4	
2. Embankment dike	3			2 Exceration, common	e e		> -		7 Embergane city	<u> </u>	n t	5 (56
3. Ribrap	m3 20) C	2 Rights		۶. د		0 0	2 Disease	e i	- و	> 0	
4. Structural concrete				4. Structural concrete				· c	4 Christian contrate	9 "	3 8	> <	_ •
5. Mass concrete			0	5. Mass concrete				_		1	3 %	, e	
6. Reinforcement steel bar	ton 1,000	0	0	6. Reinforcement steel bar		000,1	0	-	6. Reinforcement steel bar) <u>5</u>	100	· e	
7. Sodding	m2	0	0	7. Sodding	m2			0	7. Sodding	m2		ෙ	
	150	0	0	8. Curtain Groun	T .	150	0	0	8. Curtain Grout	44	150	0	_
9. Miscellaneous works (15%)	L.S.		0	9. Miscellaneous works (15%)	L.S.			0	9. Miscellaneous works (15%)	r.s	•	•	_
	•							-					
Sub-total of III			0	Sub-Total of III				0	Sub-Total of III				0
Total of I to Ill			4,491,000	Total of I to III			403	403,000	Total of 1 to III				4,894,000
N I and Acmissition and Commonstration													
1. Land acquisition 2. Compensation	m2 15 m2 200	19,700	295,500	Land Acquisition Land acquisition Compensation	m2 2	15 11,900 200 0		08,500	1V Land Acquisition and Compensation 1, Land acquisition 2. Compensation	_ m2 _ m2	15 200	31,500	474,000
Sub-Total of IV			296,000	Sub-Total of IV			178	000'8/1	Sub-Total of IV				474,000
V Engineering Services (10% of 1 to III)	G	: .	450,000	V Engineering Services (10% of I to III)	6		- 9	40,000	V Engineering Services (10% of 1 to III)	8			490,000
VI Gov. Administration (5% of 1 to IV)			240,000	VI Gov. Administration (5% of I to IV)		-	53	29,000	VI Gov. Administration (5% of I to IV)	_			269,000
VII Contingency (15% of I to VI)			822,000	VII Contingency (15% of I to VI)			. 8	000'86	VII Contingency (15% of I to VI)		-		920,000
TOTAL			A 700 DOO	TOTAL			ç	900	e G				
			200,000	70101			748		TI A				2

Table 8.10 Construction Cost of Oued Blibene

ons (8% of II & III) on, common nent, dike	Unit Unit Price Volume (DT)		Amount (DT)	Work Items Un	Unit Unit Price Volume (D7)	Volume	Amount (DT)	Work Items	Unit Unit Price (DT)	ait Price V (D'I)	Volume	Amount (DT)
Preparatory Works (8% of II & III) River Improvement 1. Excavation, common 2. Embankment, dike												
Preparatory Works (8% of II & III) River Improvement 1. Excavation, common 2. Embankment, dike												6 0**
River improvement 1. Excavation, common 2. Embankment, dike			243,000	I Preparatory Works (8% of II & III)			3,000	I Preparatory Works (8% of II & III)	<u>~</u>			246,000
mmon like				Il River Improvement				II River Improvement				
	٩n	28,600	143,000	I. Excavation, common m3	3	0	0	1. Excevation, common	m3		28,600	143,000
	ø	300	1,800	2. Embankment, dike m3	3 .	400	2,400	2. Embankment, dike	щ3	9	90	4,200
	4	0	0	3. Backfill m3		0	o	3. Backfill	m3	4	6	0
4. Structural concrete m3	8	2,800	224,000			200	16,000	4. Structural concrete	E	8	3,000	240,006
	S	0	0	5. Mass concrete m3		٥.	•	5. Mass concrete	m3	65	0	0
i bar ton	1,000	200	200,000	6. Reinforcement steel bar ton		79	20,000	6. Reinforcement steel bar	ton	000'	220	220,000
	2.5	4,400	11,000		2 2.5	0	0		m2	2.5		11.000
Road bridge, RC-T m2	850	2,190	1,861,500	8. Road bridge, RC-T m2	٠	0	0	8. Road bridge, RC-T	m2	820	2,386	1,861,500
E	2,000	Ó	0		2,000	0	0	9. Railway bridge	E	2,000	0	0
10. Other crossing facilities L.S.			187,000	10. Other crossing facilities L.S.			0	10. Other crossing facilities	ĽS.			187,000
ochure	æ	500	000'9	11. Demolish.of existing structure m3	3 30	0	0	11. Demolish of existing structure		읈	800	900'9
12 Miscellaneous works (15%) L.S.	: •		395,200			•	5,800	12. Miscellaneous works (15%)		•		401,000
Sub-Total of II			3,030,000	Sub-Total of II			44,000	Sub-Total of II			••	3,074,000
III Dom & Relanding Racin				III Dam & Decarding Bacin	•			III Dam & Retarding Basin				
T Constitution notation	*	c	•			c	~	The second of th		¥	c	Ċ
) Ł	> <	0 0	1. Excavation, continon	9 6	0	-	1. Catastanon, comment	Î	3 P		
	۶.	> <	> 0	ment, vike		0	0 0	2. Diame	ï	ç	, c	0
- alexandro	2 8	> <	9 6	Suprement concerned	3 6	٥ د		A Contract Contract	Ë	2 8	· c	c
	3 %	> <	0 0	Man commen		•		S March Appropria	ì	3 %	· c	· c
eteel but	8 8	> c		Painformannia mad har	-	> <	-		1 5	3 5	· c	
Con	} -	> <	•	Neuroscenem sieer om	•	•	0 0	7 Condina	î		, c	C
imii	150	· c	o c	Southing Cristoin Growt			- C	S. Curtain Grout	ļ -	150	•	Ö
works (15%) L	,	٠.	0	9. Miscellaneous works (15%) L.S.			0		L.S.	,		0
												-
Sub-Total of III			0	Sub-Total of III			ō	Sub-Total of III				0
Total of 1 to III			3,273,000	Total of I to III			47,000	Total of I to III				3,320,000
			<u>.</u>					,				
IV Land Acquisition and Compensation 1. Land acquisition m2	40	1,800	72,000	Acquisition and Compensation Land acquisition		200	8,000	IV Land Acquisition and Compensation 1. Land acquisition	ion m2	40	2,000	80,000
2. Compensation m2	200	200	40,000		m2 200	0	0	2. Compensation	1112	200	202	40,000
Sub-Total of IV			112,000	Sub-Total of IV			8,000	Sub-Total of IV				120,000
V Engineering Services (10% of 1 to III)			328,000	V Engineering Services (10% of I to III)			4.000	V Engineering Services (10% of I to III)	(III)			332,000
					· ·							
VI Gov. Administration (5% of 1 to IV)			170,000	VI Gov. Administration (5% of I to IV)			2,000	VI Gov. Administration (5% of 1 to IV)	ξ			172,090
VII Contingency (15% of 1 to VI)			583,000	VII Contingency (15% of I to VI)			000'6	VII Contingency (15% of 1 to VI)				592,000
TOTAL			4,466,000	TOTAL		• • •	70,000	TOTAL				4,536,000

Table 8.11 Construction Cost of Oued Hallouf

First Stage (for 10 yr Flood)			 :		Second Stage (for 100 yr Flood)					Total of First and Second Stages			٠	
work items	Unit Unit Price (DT)		volume	Amount (DT)	Work Items	Unit Uni	Unit Unit Price Volume (DT)		Amount (DT)	Work Items	Unit (Unit Unit Price (DT)	Volume	Amount (DT)
I Preparatory Works (8% of II & III)	Œ.			448,000	I Preparatory Works (8% of II & III)	, (r			162,000	I Preparatory Works (8% of II & III)				910,000
II River Improvement	Ę	¥	. 8	90	II River Improvement			5		Il River Improvement		,		
2. Embankment, dike	E E	o o	000	0	1. Excavation, common 2. Embankment, dike		s n ve	5,3 <u>7</u>	00.5/4	1. Excavation, common	E i	es e	194,500	972,500
3. Backfill	m3		57,900	231,600	3. Backfill	Ë	*	20,600	82,400	3. Backfill	2 E	₽ ₹	2 60 0	31,700
	EE	8	6,300	504,000		m3		6,700	536,000	4. Structural concrete	£	08	13.000	1040.000
5. Mass concrete	e i	ડ જ	٥ ﴿	0			8	0	0	5. Mass concrete	m3	65	0	0
o. Kemiorcaneni steel bar	E 6	000	910	610,000	6. Reinforcement steel bar			99	000'099	6. Reinforcement steel bar	ton	1,000	1.270	1,270,000
8. Road bridge, RC-T	1 21		2,700	22,500	A Asphall pavement	2E C	2.5	000,4	000,		т2	2.5	17,000	42,500
9. Railway bridge		5,000	8	450.000	9. Railway bridge		000	.	- c	6. Noad Shage, KC-1	m2	880	2,700	2,295,000
10. Other crossing facilities	L.S.	. •		230,000	10. Other crossing facilities		,		· c	10 Other constitution	E °	300	3	450,000
11. Demolish of existing structure		30	440	13,200	11. Demolish of existing structure		30	ũ	-	11. Demolish of existing structure		, Ę	. 44	13.200
12. Miscellaneous works (15%)	L.S.			730,000	12. Miscellaneous works (15%)	L.S.	ı		264,000	12. Miscellaneous works (15%)			•	984,000
Sub-Total of II				5,596,000	Sub-Total of II			7	2,025,000	Sub-Total of II	-			7621000
III Dam & Retarding Basin					Tiest of the state							٠.		
1 Fresvation common	4.0	Ų	•		Att Lam & Relading Dasin	ę.		,		III Dam & Retarding Basin	-			
2. Embankment, dike	£	ء ز	0	5 6	1. Excavation, common 2. Embankment dike	î î	v 6	0 0	<u> </u>	1. Excavation, common	m3	en i	0	6
3. Riprap	£	20	0	00		E	70	, c	- c	2. Enboundment, dike		۰ _ج	0 0	0 0
4. Structural concrete	m3	80	0	0	4. Structural concrete	m3	: £	6	0	4. Structural concrete	£ £	3 &	o c	9 6
5. Mass concrete	E.	\$5	0	0	5. Mass concrete	m3	\$9	O	0	5. Mass concrete	£	8 8		
o. Remiorcement steel bar	g (98.	.	0	6. Reinforcement steel bar		000'1	٥	•	6. Reinforcement steet bar	ton	1,000	0	6
8 Outsin Great	2	- 5	၁၀	0 (7. Sodding	m2	(0	0	7. Sodding	m2	***	0	0
9. Miscellancous works (15%)	L.S.	ξ.	٠,	> 0	Curtain Grout Miscellaneous works (15%)	. r	2	Ď,		8. Curtain Grout	** 6	150	o	0
1										7. Interchalactus works (1376)	į			>
Sub-Total of III		-		0	Sub-Total of III			-	0	Sub-Total of III				Ö
Total of I to III	• .			6,044,000	Total of I to III			4	2,187,000	Total of I to III				8,231,900
IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	ion m2 m2	200	30,900	200,000	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	ron m2 m2	40 14 200	14,300	572,000	IV Land Acquisition and Compensation 1. Land acquisition 2. Commensation	ion m2	940	45,200	1,808,000
Sub-Total of IV				1,436,000	Sub-Total of IV				772,000	Sub-Total of IV			2	2,208,000
V Engineering Services (10% of I to III)	<u>a</u>			604,000	V Engineering Services (10% of I to III)	Ê			219,000	V Engineering Services (10% of 1 to III)	(III)			823,000
VI Gov. Administration (5% of I to IV)	٤			374,000	VI Gov. Administration (5% of I to IV)	· S			148,000	VI Gov. Administration (5% of I to IV)	ş			\$22,000
VII Contingency (15% of 1 to VI)				1,269,000	VII Contingency (15% of I to VI)	:			400 000	VII Continuency (\$60, of I to VII)				
							-		2000'6'6'	(IV will be will will will will will will will wil				1,705,000
TOTAL				9,727,000	TOTAL		•	ε.	3,825,000	TOTAL				13,552,000
]					

Table 8.12 Construction Cost of Oued Hamdoun

Work Ikerus Unit Unit Unit Unit Unit Unit Unit Unit	Unit Unit Price Volume (DT)	Amount (DT)	Work Items	Unit Unit Price Volume		Amount	Work Items	Cait C	Unit Unit Price Volume		Amount
	(DT)	Œ)		5	-				Ĺ		í
1 Preparatory Works (8% of 11 & 111)						(<u>0</u>)					
1 Fightenery Profess (c. 6.11)		370,000	December Months (00% of 100)		•			2			246
		non'nec	1 rreparatory works (8% of it of 111)			000,112	I rreparatory works (6% of 11 of 111)	÷			700°14
Il River Improvement			Il River Improvement				If River improvement				
1. Excavation, common m3	5 361,200	1,806,000	1. Excavation, common	m3 5 45	459,100 2.2	2,295,500		îm3		820,300	4,101,500
	9		2. Embankment, dike	vo		0	2. Embankment dike	Ę	φ		0
	4	0			0	0	3. Backfill	EE	4	0	0
4. Structural concrete m3	80	0		50	0	0	4. Structural concrete	m3	8	0	ō
5. Mass concrete m3	. 59	0			0	0	5. Mass concrete	EE	65	0	0
6. Reinforcement steel bar ton	000,1	0	6. Reinforcement steel bar	7	٥	O	6. Reinforcement steel bar	30n	1,000	0	0
m2	2.5 3,800	9.500			• •	0		202		3,800	9.500
		1.5	8. Road bridge, RC-T		0	0	8. Road bridge, RC-T	m2		1.880	598,000
8					0	0	9. Railway bridge	E		0	0
10. Other crossing facilities L.S.		160,000				0	10. Other crossing facilities	, S			160,000
ucture	30 120			m3 30	c	6	11. Demolish of existing structure		30	120	3.600
12. Miscellaneous works (15%) L.S.		8	Miscellaneous works (15%)			344,300	12. Miscellaneous works (15%)		٠.		880,900
Sub-Total of II		4,114,000	Sub-Total of II		2,0	2,640,000	Sub-Total of II			ř	6,754,000
III Dam & Retarding Basin			III Dam & Refording Basin				III Dom & Belandion Beein	÷			
	,	-			•	_	Š			•	•
T Combackment Aits	2 6			0 t	> (o (I. Excavation, common	Ê	nt	5 0	5 (
	` ?	5 6			5 (0 (2. Ethoankment, dike	a '	٠ ;	٥ (-
		-	S. Kapitaga	27 E	D (> 0	5. Kiprap	e '	Q 8	۰ د	> <
				E .	5 (-		E '	2 6	> •	5 (
to the second			2. mass concrete	•	> <	0 0		Ę ;	6 8	> 0	> <
			7 Caddical Steel 02	00'1 Un	، د	0 (o. Acuitoxement steel bar	5	33.	> 0	> 6
kront		- C	South Co.	7111	- (> <	Southing of	į.	1 ()	> <	.
works (1506)	,		o Misselfamous made (169)	ACT	Þ	> <	S. Curtain Order	. ·	200	>	> <
		>		3		> .	y, infectianeous works (15%)	i	•	ı	>
Sub-Total of III		0	Sub-Total of III			0	Sub-Total of III				0
And the state of t		000			•	-	}				
Lotal of 1 to til		4,444,000	Total of I to III		77	2,851,000	Total of 1 to III				7,295,000
IV Land Acquisition and Compensation 1. Land acquisition m2 2. Compensation m2	30	00	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	m2 30 m2 200	00	80	IV Land Acquisition and Compensation 1. Land acquisition 2. Compensation	ion m2 m2	30	00	6 0
. Sub-Total of IV		0	Sub-Total of IV			0	Sub-Total of IV				ò
V Engineering Services (10% of 1 to III)		445,000	V Engineering Services (10% of 1 to III)			285,000	V Engineering Services (10% of 1to III)	(111)			730,000
VI Gov. Administration (5% of I to IV)		223.000	VI Gov. Administration (5% of 1 to IV)			142.000	VI Gov. Administration (5% of I to IV)	٤			365 (200)
					•					-	
VII Contingency (15% of 1 to VI)		767,000	VII Contingency (15% of I to VI)			492,000	VII Contingency (15% of 1 to VI)				1,259,000
TOTAL		5,879,000	TOTAL		'n	3,770,000	TOTAL				9,649,000

Table 9.1 Cost Benefit Streams for Oued Ennkhilet

Table 9.2 Cost Benefit Streams for Oued Greb

Net	Benefit	-1,852	998-	-723	-579	-436	-381	-326	-271	-216	-161	<u> </u>	·	80	844 843 (43)	744	1,028	1.087	1 205	1,264	1,323	1,382	1,441	1909	1,909	1,909	1,909	1,909	1,909	1,909	1 900	1,909	•		
Benefit	ļ	140	298	447	296	745	808	908	126	886	1.049	201.1	1 231	1 292	1.352	1.413	1,474	1,534	1.656	1,717	1,777	1,838	1 899	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	•	•	
	[ल्ब	251.1	1.164	1,170	1,175	1,181	1,187	1,193	1,198	202.	1,216	917.	1 227	1233	1,239	699	446	448	451	453	455	456	458 66	111		=	111	1004 604 704	111	F-4	F-4	111	•	•	
3,00	N N	e) ve	, 12	17	23	53	35	9	46	22	28	Ş Ş		50	98	65	95	76	8 2	102	104	90 5	20.5		Ξ	<u> </u>	111	111	111	111	111		•	•	
Cost	Kiver+Drain	1.152	1,152	1,152	1.152	1,152	1,152	1,152	1.152	1,152	1,152	1.152	1.152	1,152	1,152	577	321	351	351	351	351	351	351	·											
	اہ	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	1				-						٠	
	Kiver	708 803	802	802	802	802	802	802	802	20,20	\$ \$	200	208	802	802	226																			
Year	1005	9661	1661	8661	1999	2000	2001	2002	2003	2004	S SS 28	2002	2008	2009	2010	2011	2012	2013	2015	2016	2017	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Ġ		
No.		- 7	့က	4.	S	9	7	œ	ο ;	o:	= 5	<u>4 - 6</u>	7	5	16	17	2 2	5 <u>5</u>	7 1	22	23	24	3 %	72	28	53	ဓ္ဌ	31	32	33	34	32	•	•	
Net Danse	2376	1.997	-1,619	-1.240	-862	-483	416	-349	-282	-215	9 %	2,090	2.246	2,324	2,402	2.480	2,558	2,635	2.791	2,869	2,947	3,025	3,105	3,468	3,468	3,468	3,468	3,468	3,468	3,468	3,468	3,468	•	•	
Benefit			781		.562													2,979	:					,		٠				_				•	
-	100al	2.388	2,399	2,411	m	ς.	2,447				- v	227	- 00	339			21	343	· vo	90		.	·	·M	143	143	143	6	m	60	m	143	•	• .	
N.a.O.	o Cocini	12	24	36	48	29	71	83	95))		28	129	131	132	133	4 1	o vis	137	138	39	94.	142	143	143	143	143	43	143	143	143	143	•	•	
									•				_	_	-	_	Ξ:	-	_	=									_						
Cost	_	2,376	2,376	2,376	2,376	2,376	2,376	2,376		2,370	-, -		209		-			200					503						-						
1.	_								2,376		7777	200	700	209	500	500	500	3, 25		500	500	3 53 5 7 7 8							-		÷				
1.	200 2 376	200	500	503	506		500	209	209 2,376	1,3/0	27.7.1	200	700	209	500	500	500	3, 25	506	500	500	3 53 5 7 7 8	203												
Proin	200 2 376	2,167 209	2,167 209	2,167 209	2,167 209	500	2,167 209	2,167 209	209 2,376	2,15/ 209 2,3/5	27177 502 5154	209 209	209 209	209 209	209 209	209 209	209 209	3, 25	209 209	209 209	209 209	3 53 5 7 7 8	209 209			2023	2024				2028	2029	•	•	

Table 9.3 Cost Benefit Streams for Oued Gariana

Table 9.4 Cost Benefit Streams for Oued Maliyan

(Unit: 1,000 DT)	ž	Benefit	-3,738	-3,368	-2,998	-2,627	-2.257	-1,887	-1.626	64 2	2,049	2,326	2,602	2,879	3,156	3,432	3,709	3,985	4,262	4.539	4,815	5,092	5,368	5,645	5,922	6.198	6,475	6,751	7,616	7,616	7,616	7,616	7,616	7,616	7,616	7,616	7,616		•	•	7,616	
(Unit :)	Benefit	*	0	386	778	1.167	1,556	1,945	2,225	2,504	2,784	3,063	3,343	3.622	3,902	4,181	4,461	4,740	5.020	5299	5,579	5,859	6,138	6,418	6.697	6,977	7256	7,536	7,815	7,815	7,815	7,815	7,815	7,815	7,815	7,815	7,815	٠	•		7,815	
		Total	3,738	3,757	3,776	3,794	3,813	3,832	3,850	3,146	734	737	740	743	746	749	752	755	758	191	764	167	770	773	776	779	781	784	199	199	199	139	188	83	8	861	82	•	•	•	199	
		O&M	0	61	37	Se	75	93	112	131	146	149	152	155	158	161	<u>2</u>	167	169	172	175	178	181	184	187	261	193	136	199	199	38	199	661	661	199	199	199	•	•	•	199	
	Cost	River∻Drain	3,738	3,738	3,738	3,738	3,738	3,738	3,738	3,015	588	588	588	588	588	588	588	588	588	588	588	588	588	588	588	588	588	588				•										
		Drain	588	588	288	588	588	288	588	588	288	288	588	288	588	588	588	288	288	588	588	588	588	588	588	588	588	588							-				٠			
		River	3,150	3,150	3,150	3,150	3,150	3,150	3,150	2,426																																
2%	Year	1	1995	9661	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	5000	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		•.	•	2044	
EIRR = 12%	Ņ.		1	7	'n	₹	ν.	9	7	∞	6	10	11	12	13	14	5	91	11	81	19	23	21	23	23	74	23	58	23	78	23	8	31	32	83	34	35	•		•	20	
3			I															•														-										
(Unit: 1,000 DT)	Net	Benefit	-11,953	-11,057	-10,161	-9,265	-8,369	-7,473	-7,449	-7,425	-7,345	3,144	3,221	3,298	3,375	3,451	3,528	3,605	3,682	3,759	3,835	3,912	3,989	4,066	4,143	4219	4296	4,373	5,883	5,883	5,883	5,883	5,883	5,883	5,883	5,883	5,883	•	•	•	5,883	
(Unit:	Вепепі		_		1,912	2,867	3,823	4,779	4,863	4,947	5,031	5,115	5,199	5,283	5367	5,451	5,535	5,619	5,703	5,787	5,871	5,954	6,038	6,122	9079	6,290	6,374	6,458	6.542	6,542	6,542	6,542	6,542	6,542	6,542	6,542	6,542	•	•	•	6.542	
;		Total	11,953	12,013	12,073	12,132	12,192	12,252	12,312	12,372	12,376	1,971	1,978	1,985	1,992	1,999	2,006	2,014	2,021	2,028	2,035	2,042	2,049	2,057	2,064	2,071	2,078	2,085	629	629	629	629	629	629	629	629	629	•	•	•	629	
		O&M	0	8	120	179	239	530	359	418	478	538	545	552	529	266	573	581	288	565	602	809	919	624	631	638	\$45	652	629	629	629	629	629	629	639	629	629	•	•		659	
	Cost	River+Drain	11,953	11,953	11,953	11,953	11,953	11,953	11.953	11,953	11,898	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433				٠										
		Drain	1,433	1.433	1.433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1,433	1 433	1,433	1,433	1,433	1,433									٠					
		River	10.520	10.520	10,520	10,520	10,520	10,520	10,520	10,520	10,465		٠.																						· i							
%	Year				1661	8661	1999	2000	500	2002	2003	2004	2005	2005	2007	2008	2003	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		•	•	2044	
EIRR = 4%	No.		F	И	m	4	νn	vo	~	.00	0 .	01	=	72	13	14	15	91	17	38	19	82	21	23	ฆ	24	23	92	23	58	ક્ષ	Q.	31	33	33	34	35	•	•	٠	80	

Table 9.5 Cost Benefit Streams for Oued Mayzette

Table 9.6 Cost Benefit Streams for Oued Bou. Khamsa

Unit : 1,000 DT)	Net	Benefit	-693	909	-507	415	-322	-229	-223	-216	-210	961	145	416	425	435	445	454	46	473	483	202	511	521	531	540	545	\$5	825	645	%	\$5	85	\$\$	545	•	•		\$45
(Unit:	Benefit	-	0	8	192	289	385	48	169	<u> </u>	511	531	541	551	3 6	571	581	165	.	611	170	2	652	662	672	682	692	692	692	692	692	269	69	269	269	•	٠	•	692
		Total	693	969	90	703	707	710	714	77	727	728	396	135	136	136	137	137	138	138	139	140	140	141	143	14	47	47	47	47	47	47	47	47	47	•	٠	. •	47
		O&M	0	٣	r	01	4	17	21	5 7	87 31	35	38	40	\$	41	41	42	45	£ t	5 4	44	45	45	46	46	47	47	47	47	47	47	47	47	47		٠	•	47
	Cost	River	693	693	693	693	. 669	693	693	560	663	693	358	8	95	95	95	95	ጽ ፡	ጽ ያ	5 5 5	95	88	95	92	95										٠			
		Drain F		95	92	95	95	Ç.	۶۶ ۶۶	2 5	5 S	95	95	56	95	95	95	95	χ,	S 8	2 5	95	. 56	95	95	95													
		River	298	298	298	598	298	86.	598	0 0	5,98 80 80 80 80 80 80 80 80 80 80 80 80 80	598	263	÷	-																								
%	Year		1995	9661	1997	8661	1999	337	2001	7007	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		•	•	2044
EIRR = 7%	No.		-	2	m	♥ '	vn v	ا م	r- o	۰۰	01	=	13	13	14	15	91	11	<u></u>	ž (5	5 12	22	23	24	গ্ন	56	27	28	53	90	31	35	33	34	35	•	•	•	S
																							-	:								:			÷				
(Unit: 1,000 DT)	Net	Benefit	724	-635	-546	457	-368	6/7	-246	717-	-149	-110	143	299	939	6/3	710	747	784	858 858	895	932	8	900,1	1.043	080	700	1,200	200	28	200	, 200 200 200	200	200	700	•		•	1200
Unit:		ĕ																											_ '		,		_		•				
D	Benefit				185	278	370	40.	99	959	613	059	687	725	762	8	837	874	912	7 7 0 7 2 4	1,024	1,061	1 090	1.136	1,174	1,211	1,248	1.248	1,248		1,248		-	_	1,248	•	•	•	1248
)	l≝ I		0								757 613				٠	126 800					129 1,024	-	-			_	48 1,248	48 1248	48 1,248 1		48 1,248 1	1.248	1.248	_	48 1,248		•		48 1,248
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	Bc	iin O&M Total	0 724 0	4 728 93	7 732	11 735		18 /42	746	20 750	33 757	36 760	40 544	42 125	43 126	43 126	44 127	44 127	128	43 128	46 129	129	-			_		48 48 1.248	48 48 1,248		2248	1.248	1.248	1,248 1	48 48 1,248	•			
	Cost	ı River+Drain O&M Total	724 0 724 0	4 728 93	724 7 732	724 11 735	14 739	751 81 571	22 746	007 00 700	724 33 757	724 36 760	40 544	83 42 125	83 43 126	83 43 126	83 44 127	83 44 127	44 128	83 43 128	83 46 129	83 46 129	83 47 130	83 47 130		_		48 48 1248	48 48 1,248		48 48 1,248	1.248	1.248	1,248 1	48 48 1,248				
	Cost	r Drain River+Drain O&M Total	83 724 0 724 0	83 724 4 728 93	83 724 7 732	83 724 11 735	83 724 14 739	75/ 91 57/ 59	724 22 746	00/ 75/ 00 76/ 00	83 724 33 757	83 724 36 760	504 40 544	83 42 125	83 43 126	83 43 126	83 44 127	83 44 127	83 44 128	83 43 128	83 46 129	83 46 129	83 47 130	83 47 130	83 47 130	_		48 48 1248	48 48 1,248 1		48 48 1,248	1.248	1.248	1,248 1	48 48 1,248	•			
EIRR = 10%	Cost	River Drain River+Drain O&M Total	641 83 724 0 724 0	641 83 724 4 728 93	641 83 724 7 732.	641 83 724 11 735	83 724 14 739	75/ 91 57/ 50 150	641 83 724 22 746	641 62 754 50	83 724 33 757	641 83 724 36 760	83 504 40 544	83 83 42 125	83 83 43 126	83 83 43 126	83 44 127	83 83 44 127	83 84 128	83 43 128	83 83 46 129	83 83 46 129	83 47 130	83 83 47 130	83 83 47 130	_	48 48	48	2023 48 48 1,248 1	48 48 1,248 1	48 48 1	48 48 1,248 1	48 48 1.248 1	48 48 1,248 1	2029 48 48 1,248			•	

Table 9.7 Cost Benefit Streams for Oued Ain Zerga

Table 9.8 Cost Benefit Streams for Oued Hammam

(Unit: 1,000 DT)	Ž	Benefit	1.487	-1,167	-847	-527	-207	113	434	1,459	1.263	1,328	1,393	1.458	1,522	1.587	1.652	1,717	1.781	1,846	116	1,976	2,040	2,105	2,170	2,234	2.299	2364	2,952	2,952	2,952	2,952	2.952	2,952	2,952	2,952	2.952	•	•	•	2,952
(Unit:	Benefit		0	327	. 655	82	1,310	1,637	1,704	1.772	1,839	1,906	1,974	2,041	2,108	2,176	2,243	2,311	2.378	2,445	2,513	2,580	2,647	2,715	2,782	2,849	2,917	2,984	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3.051	3,051		.•	•	3,051
		Total	1,487	1,494	1,502	1,509	1,517	1,524	1.270	313	575	578	581	583	586	589	291	594	597	\$99	602	<u>\$</u>	607	019	612	615	617	620	8	66	8	66	8	8	\$	8:	8	•	•		8
		O&M	Q	7	12	77	33	37	45	21	25	55	27	8	63	65	86	70	73	92	78	81	83	98	68	16	\$6	26	8	66	8	8	\$	8	66	8	66	•	•		8
	Cost	River+Drain	1,487	1.487	1,487	1.487	1,487	1,487	1,226	262	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524							٠						
		Drain	524	524	524	524	224	224	524	224	524	224	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524													
		River	963	963	963	963	963	963	702														٠																		
18%	Year		1995	9661	1997	8661	6661	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029			•	2044
EIRR = 18%	No.		ı	7	در	4	٧.	9		∞	6	9	=	12	13	4	51	91	17	18	16	8	73	23	23	24	ઇ	56	22	78	દ્વ	8	31	32	33	85	35	•			8
(TO 000 I	Net	Benefit	419	-359	-300	-240	-181	-121	-110	66-	88	<i>LL</i> -	\$	323	353	366	379	393	406	419	432	445	458	471	484	497	511	524	561	561	561	561	%	561	561	561	561	•		•	561
(Unit : 1,000 DT)				62 -359		-		308 -121									427 379	440 393						520 471					_									•	•	•	586 561
	Į.		0		123	185	246	308	321	334	348	361	374	387	401					467	480	493	507		533	546	260	573	286	586	286	286	586	286	286	286	586		•	•	
	Į.	Total	0	62	123	185	246	308	321	334	348	361	374	64 387	48 401	414	48 427	48 440	454	467	480	493	507	49 520	49 533	546	49 560	49 573	25 586	25 586	286	286	586	286	286	286	586	•	•	•	
	Į.	O&M Total	0	2 421 62	123	185	8 427 246	10 429 308	13 432 321	15 434 334	17 436 348	19 438 361	374	64 387	48 401	414	48 427	48 440	24 48 454	24 48 467	24 48 480	24 48 493	24 48 507	24 49 520	49 533	25 49 546	49 560	49 573	25 586	25 586	286	286	586	286	286	286	586			•	
	Benefit	Total	419 0 419 0	2 421 62	419 4 423 123	6 425 185	419 8 427 246	10 429 308	419 13 432 321	15 434 334	419 17 436 348	419 19 438 361	419 21 440 374	41 23 64 387	24 23 48 401	24 23 48 414	48 427	24 48 440	24 48 454	24 48 467	24 48 480	24 48 493	24 48 507	24 49 520	24 49 533	24 25 49 546	49 560	49 573	25 586	25 586	286	286	586	286	286	286	586			•	
	Benefit	Drain River+Drain O&M Total	24 419 0 419 0	419 2 421 62	24 419 4 423 123	24 419 6 425 185	419 8 427 246	24 419 10 429 308	24 419 13 432 321	24 419 15 434 334	24 419 17 436 348	24 419 19 438 361	24 419 21 440 374	41 23 64 387	24 23 48 401	24 23 48 414	24 23 48 427	24 24 48 440	24 24 48 454	24 48 467	24 48 480	24 48 493	24 48 507	24 49 520	24 49 533	24 25 49 546	24 25 49 560	49 573	25 586	25 586	286	286	586	286	286	286	586		•		
	Benefit	River Drain River+Drain O&M Total	395 24 419 0 419 0	395 24 419 2 421 62	395 24 419 4 423 123	395 24 419 6 425 185	395 24 419 8 427 246	395 24 419 10 429 308	395 24 419 13 432 321	395 24 419 15 434 334	395 24 419 17 436 348	395 24 419 19 438 361	412 24 419 21 440 374	24 41 23 64 387	24 24 23 48 401	24 24 23 48 414	24 23 48 427	24 24 24 48 440	24 24 48 454	24 24 24 48 467	24 48 480	24 24 48 493	24 24 48 507	24 49 520	24 24 24 49 533	24 24 25 49 546	24 24 25 49 560	49 573	25 25 586	25 25 586	286	25 25 586	25 25 586	5 25 25 586	25 25 586	286	586			•	

Table 9.9 Cost Benefit Streams for Oued Blibene

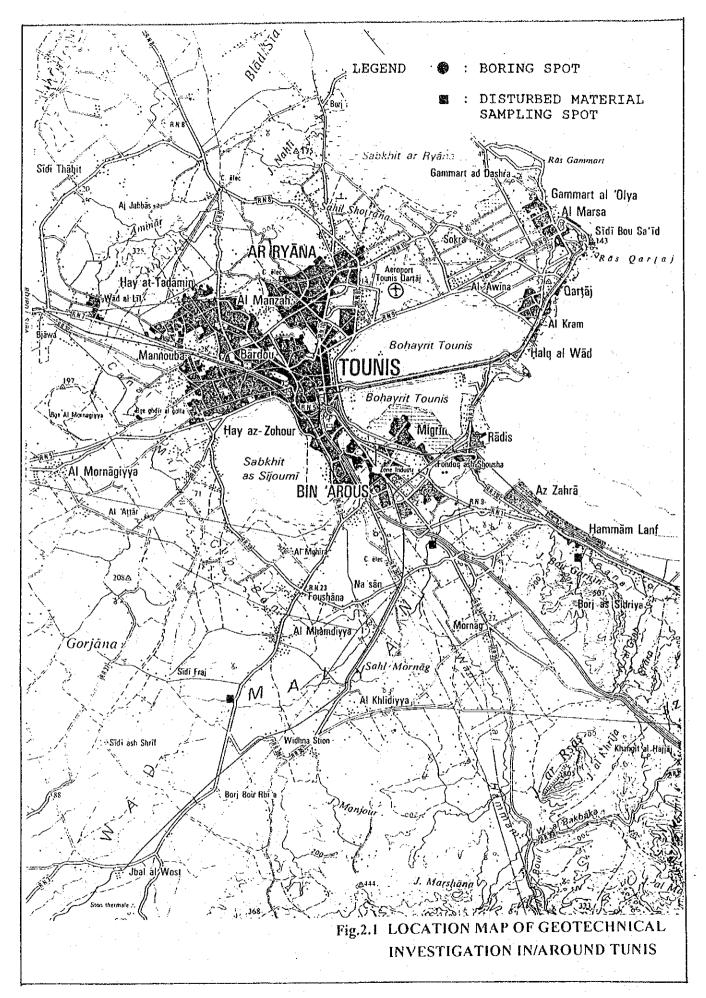
Table 9.10 Cost Benefit Streams for Oued Hallouf

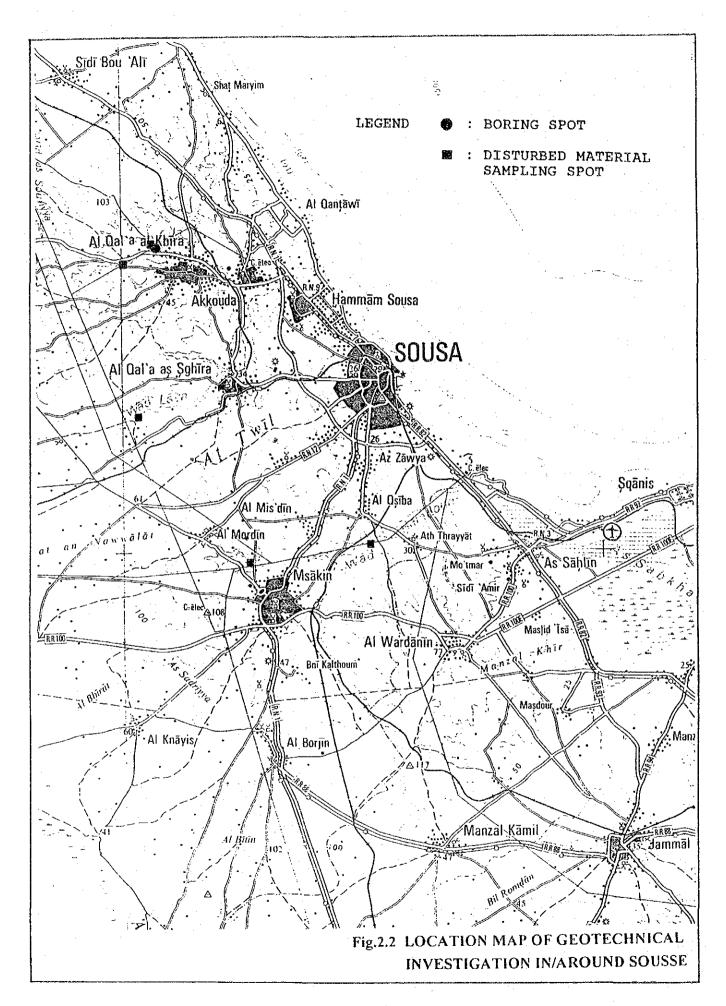
(Unit: 1,000 DT) Benefit Benefit 202 1 203 1 203 1 203 1 203 1 203 20 Year EIRR = 13% Š (Unit: 1,000 DT) Benefit 681 681 681 681 750 88 Year 2013 2015 2031

Table 9.11 Cost Benefit Streams for Oued Hamdoun

	,							
Š.	Year			Cost			Benefit	Š
		River	Drain	River+Drain	O&M	Total		Benefil
_	1995	894	808	1,502	0	1,502	0	-1,502
7	1996	894	809	1,502	∞	1,510	188	-1,322
m	1997	894	80	1,502	15	1,517	376	-1,141
4	1998	894	809	1,502	23	1,525	564	-96
2	1999	894	89	1,502	30	1,532	752	780
ý	2000	894	80 80	1,502	38	1.540	940	99
~	2001	894	9	1,502	45	1.547	957	-590
∞	2002	894	88	1,502	53	1,555	575	-580
6	2003	894	8	1,502	8	1,562	665	-570
2	2004	761	809	1,369	89	1.436	010.1	-426
11	2005		808	809	74	682	1,027	345
12	2006		808	909	77	989	1,045	329
13	2007		6 03	809	28	689	1,062	373
14	2008	٠	808	909	84	692	1,079	388
15	2009		808	809	87	695	1,097	405
92	2010	-	808	809	8	869	1,114	417
17	2011		809	809	93	701	1,132	431
8	2012		808	809	8	, \$	1.149	445
19	2013		88	809	66	707	1,167	99
8	2014		808	809	102	710	1.184	474
21	2015		ŝ	809	105	713	1,201	486
21	2016		908	809	108	716	1,219	503
ន	2017		808	809	Ξ	719	1,236	517
73	2018		808	809	114	722	1.254	532
33	2019		808	808	117	725	1,271	546
92	2020		% %	809	120	728	1,289	261
23	2021				123	123	1,306	1,183
82	2022	٠		•	123	123	1,306	1,183
23	2023				123	123	1306	1,183
30	2024				123	123	1306	1,183
31	2025	:			123	123	1,306	1,183
33	2026				123	123	1,306	1,183
33	2027			,	123	123	1,306	1,183
34	2028				123	123	1,306	1,183
35	2029				123	123	1,306	1,183
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Fig.2.3 Log of Core boring (3)

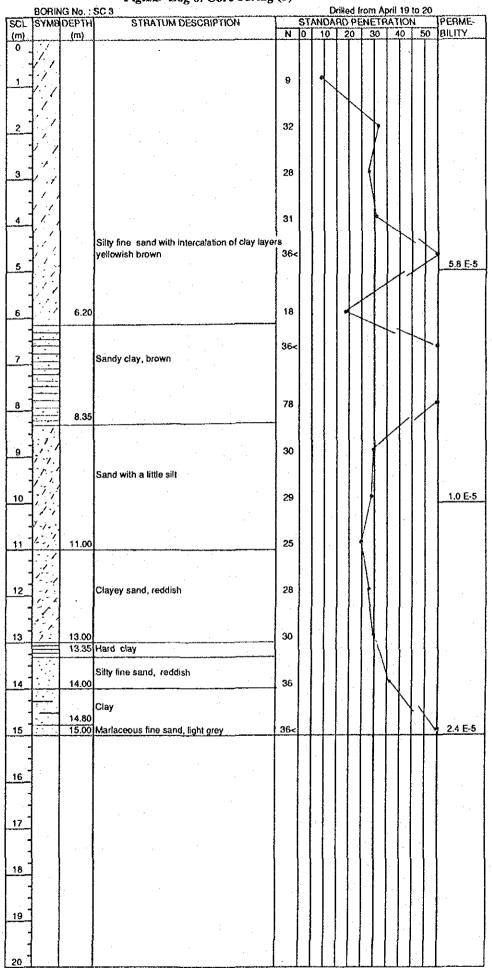


Fig. 2.4 Logs of Sampling pits

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1	1/•/
2	2 Fine sand with a little clay and small gravel
	yellowish brown
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	1½//
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I-3	S-4
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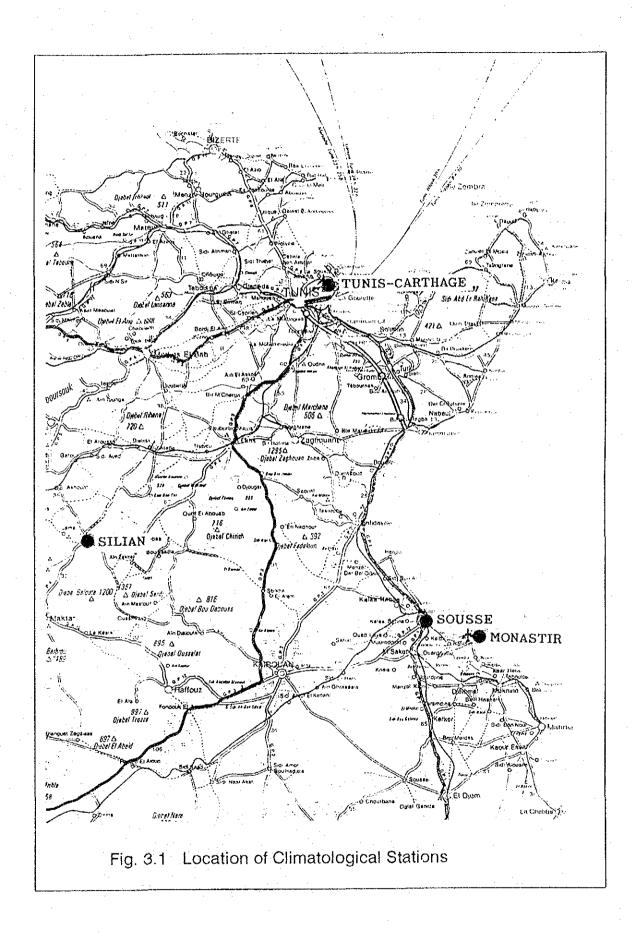


Fig. 3.2 Available Daily Rainfall Records (1/3)

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Note: (=) Data collected

Source: "Annuaire Pluviometrique de Tunisie", Direction General des Ressources en Eau

Fig. 3.2 Available Daily Rainfall Records (2/3)

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Note: (=) Data collected

Source: 'Annuaire Pluviometrique de Tuniaie', Direction General des Ressources en Eau

Fig. 3.2 Available Daily Rainfall Records (3/3)

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	Name of Station	AKOUDA SM	BALAOUM KALAAT KEBIRA	CHOTT MARIEM CRGR	72004 JEMMEL	EL ONK SE	HAMMAM SOUSSE	KALAA KEBIRA	KALAA SEGHIRA	JEMMEL CFPA	MASAKEN DELG SM	74951 OUED LAYA	76210 SIDI BOU ALI	SIDI EL HANT CTV	SKANES MONASTIR SM	SOUSSEPF	78232 ZERAMDINE
	Code	70583	76747	71637	72004	72525	73069	73509	73510	74386	74603	74951	76210	26400	76788	77077	78232
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Note: (=) Data collected

Source: "Annuaire Pluviometrique de Tuniaie", Direction General des Ressources en Eau

