

Tableau 9.1.1 Caractéristique Principales de No.5 N’Fifikh

		Description			Remark
A. Dam					
1 General					
Province		Ben Slimane			
River		Oued Daliya			
Coordinate of dam site		X11	345,640	Location: direct distance 25km from Ben Slimane	
		Y11	311,800		
		Xr2	345,700		
		Yr2	312,200		
2 Hydrology					
Catchment area		km2	323.00		
Annual mean rainfall		mm	323.00		
Annual mean run-off		Mm3	13.32		
3 Reservoir					
Gross storage		m3	19,200,000.00		
Effective storage		m3	17,700,000.00		
Dead storage		m3	1,500,000.00	30,000m3/yr. x 50yrs	
Reservoir surface area		ha	173.60		
Elevation of flood water level (FWL)		m	248.64	Hd=3.64m	
Elevation of normal water level (NWL)		m	245.00		
Elevation of low water level (LWL)		m	225.50		
4 Dam Body					
Geology of foundation		Alternation of sandstone & Pelitic stone (Devonian to Carboniferous)			
Type of dam		Center-cored rock fill			
Elevation of dam crest	EL		251.50	Freeboard	above FWL 2.86
Elevation of dam foundation	EL		204.00		above NWL 6.50
Height from proposed foundation	m		47.50		
Length of dam crest	m		325.00		
Upstream slope			1:2.50		
Downstream slope			1:2.00		
Width of dam crest	m		6.00		
Seismic intensity			0.10	(100yr.acceleration=42gal)	
Embankment quantity (total)		m3	678,400.00		
	Core	m3	142,500.00		
	Filter & drain + Gravel, rock	m3	515,600.00		
	Rip rap	m3	20,300.00		
5 Spillway					
Location		Right bank			
Geology of foundation		Sandstone & Pelitic stone of CL-CM			
Design inflow discharge (10,000yr)	m3/s		1,800.00		
Design outflow discharge(10,000yr)	m3/s		1,668.00		
Type of weir		Non gated side channel			
Weir length /width			120m x 25m		
Design overflow depth	m		3.64		
Type of stilling basin		Hydraulic jump type			
6 Intake/Outlet					
Type		Inclined conduit			
		D600mm slide gate x 2			
Intake location		Left bank			
Capacity	m3/s		1.61		
Outlet pipe		D1000mm x 270m			
Discharge control valve		D1000mmJFG			
Raw water facilities		D300mm pipe and D300 sluice valve			
7 Diversion					
Type		Cofferdam/Culvert			
Design inflow discharge(20yr/50yr)	m3/s		250.0/380.0		
Design outflow discharge(20yr/50yr)	m3/s		236.1/271.0		
Cofferdam crest elevation	m		226.50		
Upstream water level(20yr/50yr)	m		221.1/226.2		
Culvert location		Left abutment			
Culvert section/length			5m x 5m / 300m		
8 Dam Construction Cost					
1.Direct cost					
1.1 Diversion works	MDH		18.07		
1.2 Foundation excavation	MDH		7.65		
1.3 Foundation treatment	MDH		3.56		
1.4 Dam embankment	MDH		11.56		
1.5 Spill way	MDH		70.49		
1.6 Intake works	MDH		3.66		
1.7 Gate and pipe	MDH		8.56		
1.8Overhed and profit of contractor	MDH		19.60		
	Sub-total	MDH	143.15		
2.Physical contingency	MDH		14.32		
3.Price contingency	MDH		36.20		
	Total	MDH	193.67		
4.Value added tax(14%)	MDH		27.11		
	Ground total	MDH	220.70	325 DH/m3	
B. Irrigation					
9 Service Area					
Service area (Net)		ha	1,000.00		
10 Irrigation Construction Cost					
1.Direct cost					
1.1 Main canal	MDH		12.82		
1.2 Structures	MDH		21.29		
1.3Overhed and profit of contractor	MDH		2.39		
	Sub-total	MDH	36.50		
2.Physical contingency	MDH		3.65		
3.Price contingency	MDH		9.23		
	Total	MDH	49.38		
4.Value added tax(14%)	MDH		6.91		
	Ground total	MDH	56.30	56,300 DH/ha	

Tableau 9.1.2 Caractéristique Principales de No.9 Taskourt

Description		Remark
A. Dam		
1 General		
Province	Marrakech	
River	Oued Al Mal	
Coordinate of dam site	X11	206,800.00 Location: sidi Bou Othmane
	Y11	69,900.00
	Xr2	206,900.00
	Yr2	69,600.00
2 Hydrology		
Catchment area	km2	419.00
Annual mean rainfall	mm	366.00
Annual mean run-off	Mm3	44.65
3 Reservoir		
Gross storage	m3	25,100,000.00
Effective storage	m3	19,100,000.00
Dead storage	m3	6,000,000.00 120,000m3/yr. x 50yrs
Reservoir surface area	ha	124.73
Elevation of flood water level (FWL)	m	998.95 Hd=3.95m
Elevation of normal water level (NWL)	m	995.00
Elevation of low water level (LWL)	m	973.00
4 Dam Body		
Geology of foundation	Schist	(Ordovician)
Type of dam	Concrete gravity by RCC	
Elevation of dam crest	EL	1,000.50 Freeboard
Elevation of dam foundation	EL	927.00 above FWL 1.55
Height from proposed foundation	m	73.50 above NWL 5.50
Length of dam crest	m	225.00
Upstream slope		1:0.20
Downstream slope		1:0.84
Width of dam crest	m	5.00
Seismic intensity		0.12 (100yr.acceleration=102gal)
Dam concrete quantity (total)	m3	415,000.00
	Conventional concrete	m3 100,300.00
	RCC concrete	m3 314,700.00
5 Spillway		
Location		Center of dam body
Geology of foundation		Schist
Design inflow discharge(1,000yr/10,000yr)	m3/s	1,700/2,300
Design outflow discharge(1,000yr/10,000yr)	m3/s	1,569/2,138
Type of weir		Non gate straight crest
Weir length and width		100m x 80m
Design overflow depth(1,000yr/10,000yr)	m	3.95/4.85
Type of stilling basin		Hydraulic jump type
6 Intake/Outlet		
Type		Intake tower
Intake location		W2.5XH3.0m slide gate x 2
Capacity	m3/s	Right side of dam body 6.76
Outlet pipe		D2000mm x 125 m
Discharge control valve		D2000mm JFG
Raw water facilities		D300mm pipe and D300 sluice valve
7 Diversion		
Type		Cofferdam/Buried culvert
Design inflow discharge(10yr/20yr)	m3/s	400.0/600.0
Design outflow discharge(10yr/20yr)	m3/s	339.7/474.2
Cofferdam crest elevation	m	962.50
Upstream water level(10yr/20yr)	m	955.4/962.3
Culvert location		Right side of river
Culvert section/length		7.2m x 7.2m/270m
8 Dam Construction Cost		
1.Direct cost		
1.1 Diversion works	MDH	5.21
1.2 Foundation excavation	MDH	17.22
1.3 Foundation treatment	MDH	9.69
1.4 Dam embankment	MDH	175.85
1.5 Spill way	MDH	2.05
1.6 Intake works	MDH	2.41
1.7 Gate and pipe	MDH	12.40
1.8Overhed and profit of contractor	MDH	50.55
	Sub-total	MDH 275.38
2.Physical contingency	MDH	27.54
3.Price contingency	MDH	69.63
	Total	MDH 372.55
4.Value added tax(14%)	MDH	52.16
	Ground total	MDH 424.60 1023 DH/m3
B. Irrigation		
9 Service Area		
Service area (Net)	ha	4,500
10 Irrigation Construction Cost		
1.Direct cost		
1.1 Main canal	MDH	38.55
1.2 Structures	MDH	84.54
1.3Overhed and profit of contractor	MDH	8.62
	Sub-total	MDH 131.71
2.Physical contingency	MDH	13.17
3.Price contingency	MDH	33.32
	Total	MDH 178.20
4.Value added tax(14%)	MDH	24.94
	Ground total	MDH 203.10 45,100 DH/ha

Tableau 9.1.3 Caractéristique Principales de No.10 Timkit

		Description	Remark	
A. Dam				
1 General				
Province		Errachidia		
River		Assif N'ifer		
Coordinate of dam site	Xr1		507,335.00	Location: Tinjdid
	Yr1		515,200.00	
	XI2		507,550.00	
	YI2		515,500.00	
2 Hydrology				
Catchment area		km2	572.00	
Annual mean rainfall		mm	186.00	
Annual mean run-off		Mm3	10.11	
3 Reservoir				
Gross storage		m3	27,500,000.00	
	Flood storage	m3	20,000,000.00	
Effective storage		m3	3,500,000.00	
Dead storage		m3	4,000,000.00	200,000m3/yr. x 20yrs
Reservoir surface area		ha	172.50	
Elevation of flood water level (FWL)		m	1,258.12	Hd=2.32m
Elevation of surcharge water level (SWL)		m	1,255.80	
Elevation of normal water level (NWL)		m	1,245.00	
Elevation of low water level (LWL)		m	1,240.30	
4 Dam Body				
Geology of foundation		Limestone		(Lower Jurassic)
Type of dam		Concrete gravity by RCC		
Elevation of dam crest	EL		1,259.50	Freeboard above FWL 1.38
Elevation of dam foundation	EL		1,195.00	above NWL 14.50
Height from proposed foundation	m		64.50	
Length of dam crest	m		210.00	
Upstream slope			1:0.20	
Downstream slope			1:0.86	
Width of dam crest	m		5.00	
Seismic intensity			0.10	(100yr.acceleration=88gal)
Dam concrete quantity (total)		m3	227,600.00	
	Conventional concrete	m3	44,900.00	
	RCC concrete	m3	182,700.00	
5 Spillway				
Location		Center of dam body		
Geology of foundation		Limestone		
Design inflow discharge(1,000yr/10,000yr)	m3/s		2,000/2,800	
Design outflow discharge(1,000yr/10,000yr)	m3/s		426/826	
Type of weir		Non gate straight crest		
Weir length	m		60.00	
Design overflow depth(1,000yr/10,000yr)	m		2.32/3.61	
Type of stilling basin		Hydraulic jump type		
6 Intake/Outlet				
Type		Intake tower		
		D400mm slide gate x 1		
Intake location		Right side of dam body		
Capacity	m3/s		0.45	
Outlet pipe		D600 mm x 60 m		
Discharge control valve		D300mmJFG		
Flood control gate		4m x 4m slide gate and pressure conduit		
Raw water facilities		D400mm pipe and D400 sluice valve		
Sediment flush pipe		D800mm		
7 Diversion				
Type		Cofferdam/Buried culvert		
Design inflow discharge(10yr/20yr)	m3/s		300.0/500.0	
Design outflow discharge	m3/s		300.0/348.4	
Cofferdam crest elevation	m		1,230.50	
Upstream water level	m		1,217.8/1,230.2	
Culvert location		Left side of river		
Culvert section/length		6.0mm x 6.00mm/200m		
8 Dam Construction Cost				
1.Direct cost				
1.1 Diversion works		MDH	3.32	
1.2 Foundation excavation		MDH	10.50	
1.3 Foundation treatment		MDH	17.67	
1.4 Dam embankment		MDH	85.70	
1.5 Spill way		MDH	0.99	
1.6 Intake works		MDH	0.59	
1.7 Gate and pipe		MDH	3.44	
1.8 Sabo dam works		MDH	18.86	
1.9 Overhead and profit of contractor		MDH	21.31	
	Sub-total	MDH	162.38	
2.Physical contingency		MDH	16.24	
3.Price contingency		MDH	41.06	
	Total	MDH	219.68	
4.Value added tax(14%)		MDH	30.75	
	Ground total	MDH	250.30	1,100 DH/m3
B. Irrigation				
9 Service Area				
Service area (Net)		ha	3,060	
10 Irrigation Construction Cost				
1.Direct cost				
1.1 Main canal		MDH	15.89	
1.2 Structures		MDH	89.07	
1.3Overhed and profit of contractor		MDH	7.35	
	Sub-total	MDH	112.31	
2.Physical contingency		MDH	11.23	
3.Price contingency		MDH	28.41	
	Total	MDH	151.95	
4.Value added tax(14%)		MDH	21.27	
	Ground total	MDH	173.20	56,600 DH/ha

Tableau 9.1.4 Caractéristique Principales de No.17 Azghar

		Description	Remark			
A. Dam						
1 General						
Province		Sefrou				
River		Oued Zloul				
Coordinate of dam site	Xr1		598,750.00	Location: Sefrou		
	Yr1		3,573,500.00			
	XI2		599,103.00			
	YI2		3,570,500.00			
2 Hydrology						
Catchment area	km2		263.00			
Annual mean rainfall	mm		447.00			
Annual mean run-off	Mm3		53.21			
3 Reservoir						
Gross storage	m3		11,700,000.00			
Effective storage	m3		5,200,000.00			
Dead storage	m3		6,500,000.00	130,000m3/yr. x 50yrs		
Reservoir surface area	ha		118.27			
Elevation of flood water level (FWL)	m		856.89	Hd=2.89m		
Elevation of normal water level (NWL)	m		854.00			
Elevation of low water level (LWL)	m		848.50			
4 Dam Body						
Geology of foundation		Marl		(Lower Liassic)		
Type of dam		Center-cored rock fill				
Elevation of dam crest	EL		859.50	Freeboard	above FWL 2.61	
Elevation of dam foundation	EL		817.00		above NWL 5.50	
Height from proposed foundation	m		42.50			
Length of dam crest	m		325.00			
Upstream slope			1:2.80			
Downstream slope			1:2.40			
Width of dam crest	m		6.00			
Seismic intensity			0.12	(100yr.acceleration=66gal)		
Embankment quantity (total)	m3		769,800.00			
	Core	m3	130,900.00			
	Filter & drain + Gravel, rock	m3	615,800.00			
	Rip rap	m3	23,100.00			
5 Spillway						
Location		Right bank				
Geology of foundation		Marl of CM-CH				
Design inflow discharge(10,000yr)	m3/s		700.00			
Design outflow discharge(10,000yr)	m3/s		592.00			
Type of weir		Non gated side channel				
Weir length and width			60m x 15m			
Design overflow depth(10,000yr)	m		2.89			
Type of stilling basin		Hydraulic jump with roller bucket				
6 Intake/Outlet						
Type		Composite type inclined tower				
		D1000mmslide gate x 1				
Intake location		Left bank				
Capacity	m3/s		2.60			
Outlet pipe		D1000 mm x 480 m				
Discharge control valve		D1000mm Sleeve valve				
Raw water facilities		D300mm pipe and D300 sluice valve				
Sediment flush pipe		D800mm				
7 Diversion						
Type		Cofferdam/Culvert				
Design inflow discharge(20yr/50yr)	m3/s		250.0/300.0			
Design outflow discharge(20yr/50yr)	m3/s		212.6/221.6			
Cofferdam crest elevation	m		835.00			
Upstream water level(20yr/50yr)	m		831.5/834.7			
Culvert location		Right side of Riverbed				
Culvert section/length			5m x 5m / 240m			
8 Dam Construction Cost						
1.Direct cost						
1.1 Diversion works	MDH		19.36			
1.2 Foundation excavation	MDH		9.59			
1.3 Foundation treatment	MDH		5.42			
1.4 Dam embankment	MDH		16.03			
1.5 Spill way	MDH		35.29			
1.6 Intake works	MDH		1.21			
1.7 Gate and pipe	MDH		12.42			
1.8Overhed and profit of contractor	MDH		13.18			
	Sub-total	MDH	112.50			
2.Physical contingency	MDH		11.25			
3.Price contingency	MDH		28.45			
	Total	MDH	152.20			
4.Value added tax(14%)	MDH		21.30			
	Ground total	MDH	173.40	225 DH/m3		
B. Irrigation						
9 Service Area						
Service area (Net)	ha		2,000			
10 Irrigation Construction Cost						
1.Direct cost						
1.1 Main canal	MDH		12.22			
1.2 Structures	MDH		56.32			
1.3Overhed and profit of contractor	MDH		4.80			
	Sub-total	MDH	73.34			
2.Physical contingency	MDH		7.33			
3.Price contingency	MDH		18.55			
	Total	MDH	99.22			
4.Value added tax(14%)	MDH		13.89			
	Ground total	MDH	113.10	56,600 DH/ha		

Tableau 9.2.1 Volume de Construction pour Barrage et Installations d'Irrigation (1/2)

	Work Item	Unit	Quantity			
			No.5 N'Fifikh	No.9 Taskourt	No.10 Timkit	No.17 Azghar
A. Dam						
1	River Diversion Works					
	Excavation / hauling, soil & gravel	m ³	2,800	-	-	53,400
	- ditto -, rock	m ³	24,200	-	-	22,900
	Backfill,soil	m ³	300	-	-	0
	Embankment, soil	m ³	64,600	-	-	34,100
	Reinforced concrete	m ³	12,984	3,614	2,660	13,320
	Plain concrete (Plugging)	m ³	5,000	2,592	1,615	6,000
	Form work	m ²	5,860	3,154	2,169	6,000
2	Foundation Excavation					
	Excavation / hauling, soil & gravel	m ³	123,900	102,300	73,400	211,100
	- ditto -, rock	m ³	49,000	139,800	92,500	46,900
3	Foundation Treatment Works					
	Curtain grouting work	m	3,146	6,437	13,193	4,791
	Consolidation grouting work	m	-	2,041	1,649	-
4	Dam Emnbankment					
	Impervious zone	m ³	142,500	-	-	130,900
	Filter and Transition zone	m ³	515,600	-	-	615,800
	Rip-rap	m ³	20,300	-	-	23,100
	Inner concrete	m ³	-	314,715	182,725	-
	Outer concrete	m ³	-	99,135	44,000	-
	Rinforced concrete	m ³	-	1,152	909	-
	Tie rod	ton	-	39	31	-
5	Spillway					
	Excavation / hauling, soil & gravel	m ³	343,300	-	-	156,000
	- ditto -, rock	m ³	85,800	-	-	39,000
	Backfill,soil	m ³	54,600	-	-	26,600
	Reinforced concrete	m ³	59,665	1,980	1,052	29,390
	Form work	m ²	24,405	2,840	1,522	22,565
6	Outlet Works					
	Reinforced concrete	m ³	1,260	2,360	615	1,099
	Plain concrete	m ³	4,642	-	-	324
	Form work	m ²	394	2,674	1,281	1,430
7	Gate and Pipe					
	Slide gate	pcs	2	2	2	2
	Steel pipe	m	280	73	50	260
	Jet flow gate	pcs	1	1	1	1
	Sleeve valve	pcs	-	-	-	1
	Flow meter	pcs	1	1	1	1
8	Sabo Dam					
	Excavation / hauling, soil & gravel	m ³	-	-	25,500	-
	- ditto -, rock	m ³	-	-	25,500	-
	Sabo dam body	m ³	-	-	47,815	-

Tableau 9.2.1 Volume de Construction pour Barrage et Installations d'Irrigation (2/2)

	Work Item	Unit	Quantity			
			No.5 N'Fifikh	No.9 Taskourt	No.10 Timkit	No.17 Azghar
B. Irrigation Facilities						
1	Main Canal					
	Main Canal	m	9,200	21,600	-	13,545
	Branch Canal (1)	m	9,250	15,280	-	2,580
	Branch Canal 2	m	-	-	-	5,515
	Branch Canal 3	m	-	-	-	2,670
	Main Feeder Canal 1	m	2,500	-	-	-
	Main Feeder Canal 2	m	4,450	-	-	-
	Flume Canal (rehabilitation)	m	-	-	3,600	-
	Masonry Canal (rehabilitation)	m	-	-	34,900	-
2	Structures					
	Head work (Diversion)	pcs	3	1	12	-
	Syphon	pcs	9	1	-	20
	Drop	m	-	4,790	-	875
	Offtake	pcs	32	18	-	50
	Spill way	pcs	4	6	-	7
	Check	pcs	8	-	-	13
	Aqueduct	pcs	1	-	-	-
	Cross Drain	pcs	63	102	-	60
	Bridge	pcs	25	37	-	26
	Box culvert	m	-	-	-	65
	On-farm facilities	ha	1,000	4,500	3,060	2,000
	Well	pcs	-	-	37	-
	River channel	m	-	-	5,000	-

Tableau 9.2.2 Période de Construction de Barrage(2/4)

Work Item	Unit	Quantity	Critical Equipment	Production Rate		Working Days	Working Rate	Construction Days	Set no.	Construction Period		Other Equipments									
				/hour	/day					day	month	1st	no.	2nd	no.	3rd	no.	4th	no.	5th	no.
II Taskourt																					
1	River Diversion Works									143	5										
	Excavation, Cutoff wall	LS	1						1	30		BD 44t	1 BH 1.2m3	1 TS 5.4m3	1 DT 32t	2					
	Reinforced concrete	m3	3,614	AT 4.4m3	6.9	38.6	93.5	1.20	112.2	113		CM 2.0m3*3	1 TS 2.0m3	1 G 100kVA	1 CP 100m3/h	1 TC 25t			1		
2	Foundation Excavation									223	8										
	Excavation / hauling, soil & gravel	m3	102,300	BD 44t	206.3	1,155.3	88.5	1.20	106.2	2	54	TS 5.4m3	2 DT 32t	8							
	- ditto -, rock, ripping	m3	111,840	RD 32t	174.5	977.2	114.4	1.20	137.3	2	69	BD 32t	4 TS 5.4m3	2 DT 32t	8						
	- ditto -, rock, blasting	m3	27,960	CD 150kg	-	168.0	166.4	1.20	199.7	2	100	BD 32t	1 TS 5.4m3	1 DT 32t	1						
3	Foundation Treatment Works									744	25										
	Curtain grouting work	m	6,437	GP 7.8kw	-	8.5	757.3	1.20	908.8	2	455	BM 5.5kW	1 GM 2.2kW	2 G 60kVA	1						
	Consolidation grouting work	m	2,041	GP 7.8kw	-	8.5	240.1	1.20	288.1	1	289	CD 150kg	1 GM 2.2kW	1 G 60kVA	1						
4	Dam Emnbankment									898	30										
	Concrete	m3	415,002	CM 2.0m3*3	98.6	552.2	751.6	1.15	867.2	1	868	DT 10t	15 TS 2.0m3	1 G 100kVA	1 TC 25t	1					
	Others	LS	1							30											
5	Outlet Works									235	8										
	Reinforced concrete	m3	2,360	AT 4.4m3	6.9	38.6	61.1	1.20	73.3	1	74	CM 2.0m3*3	1 TS 2.0m3	1 G 100kVA	1 CP 100m3/h	1 DT 4t			1		
	Gate and pipe installation	LS	1							80		TC 25t	1 DT 4t	1							
	Plain concrete (plugging)	m3	2,592	AT 4.4m3	6.9	38.6	67.1	1.20	80.5	1	81	CM 2.0m3*3	1 TS 2.0m3	1 G 100kVA	1 CP 100m3/h	1					

Tableau 9.2.2 Période de Construction de Barrage (3/4)

Work Item	Unit	Quantity	Critical Equipment	Production Rate		Working Days	Working Rate	Construction Days	Set no.	Construction Period		Other Equipments									
				/hour	/day					day	month	1st	no.	2nd	no.	3rd	no.	4th	no.	5th	no.
III Timkit																					
1	River Diversion Works																				
	Excavation, Cutoff wall	LS	1							152	6										
	Reinforced concrete	m3	2,660	AT 4.4m3	6.9	38.6	68.8	1.11	76.4	1	75	BD 44t	1 BH 1.2m3	1 TS 5.4m3	1 DT 32t	2					
2	Foundation Excavation																				
	Excavation / hauling, soil & gravel	m3	73,400	BD 44t	206.3	1,155.3	63.5	1.11	70.6	2	36	TS 5.4m3	2 DT 32t	8							
	- ditto -, rock, ripping	m3	74,000	RD 32t	174.5	977.2	75.7	1.11	84.1	1	85	BD 32t	2 TS 5.4m3	1 DT 32t	4						
	- ditto -, rock, blasting	m3	18,500	CD 150kg	-	168.0	110.1	1.11	122.3	2	62	BD 32t	1 TS 5.4m3	1 DT 32t	1						
3	Foundation Treatment Works																				
	Curtain grouting work	m	13,193	GP 7.8kw	-	8.5	1,552.1	1.11	1,724.6	3	575	BM 5.5kW	2 GM 2.2kW	3 G 60kVA	1						
	Consolidation grouting work	m	1,649	GP 7.8kw	-	8.5	194.0	1.11	215.6	2	108	CD 150kg	1 GM 2.2kW	2 G 60kVA	1						
4	Dam Embankment																				
	Inner concrete	m3	226,725	CM 1.0m3*2	58.4	327.0	693.3	1.07	742.8	1	743	DT 10t	5 TS 2.0m3	1 G 100kVA	1 TC 25t	1					
	Others	LS	1								30										
5	Outlet Works																				
	Reinforced concrete	m3	615	AT 4.4m3	6.9	38.6	15.9	1.07	17.0	1	17	CM 1.0m3*2	1 TS 2.0m3	1 G 100kVA	1 CP 100m3/h	1 DT 4t					
	Gate and pipe installation	LS	1								90	TC 25t	1 DT 4t	1							
	Plain concrete (plugging)	m3	1,615	AT 4.4m3	6.9	38.6	41.8	1.07	44.8	1	45	CM 1.0m3*2	1 TS 2.0m3	1 G 100kVA	1 CP 100m3/h	1					
6	Sabo Dam																				
	Excavation / hauling, soil & gravel	m3	25,500	BD 44t	206.3	1,155.3	22.1	1.20	26.5	2	14	TS 5.4m3	2 DT 32t	8							
	- ditto -, rock, ripping	m3	20,400	RD 32t	174.5	977.2	20.9	1.20	25.1	1	26	BD 32t	2 TS 5.4m3	1 DT 32t	4						
	- ditto -, rock, blasting	m3	5,100	CD 150kg	-	168.0	30.4	1.20	36.5	2	19	BD 32t	1 TS 5.4m3	1 DT 32t	1						
	Masonry	m3	47,815	BH 0.6m3	-	100.0	478.2	1.07	512.4	2	257	CM 0.5m3*1	1 G 100kVA	1							

Tableau 9.2.2 Période de Construction de Barrage (4/4)

Work Item	Unit	Quantity	Critical Equipment	Production Rate		Working Days	Working Rate	Construction Days	Set no.	Construction Period		Other Equipments										
				/hour	/day					no.	day	month	1st	no.	2nd	no.	3rd	no.	4th	no.	5th	no.
IV Azghar																						
1	River Diversion Works																					
	Excavation / hauling, soil & gravel	m3	53,400	BD 44t	206.3	1,155.3	46.2	1.20	55.4	1	216	8										
	- ditto -, rock, ripping	m3	18,320	RD 32t	174.5	977.2	18.7	1.20	22.4	1	56		TS 5.4m3	1	DT 32t	4						
	- ditto -, rock, blasting	m3	4,580	CD 150kg	-	168.0	27.3	1.20	32.8	1	23		BD 32t	2	TS 5.4m3	1	DT 32t	4				
	Reinforced concrete	m3	13,320	AT 4.4m3	6.9	38.6	344.7	1.20	413.6	4	33		BD 32t	1	TS 5.4m3	1	DT 32t	1				
2	Foundation Excavation																					
	Excavation / hauling, soil & gravel	m3	211,100	BD 44t	206.3	1,155.3	182.7	1.30	238.3	2	229	8										
	- ditto -, rock, ripping	m3	37,520	RD 32t	249.2	1,395.5	26.9	1.30	35.1	1	120		TS 5.4m3	2	DT 32t	8						
	- ditto -, rock, blasting	m3	9,380	CD 150kg	-	168.0	55.8	1.30	72.8	1	36		BD 32t	2	TS 5.4m3	1	DT 32t	4				
	Reinforced concrete	m3	29,390	AT 4.4m3	6.9	38.6	760.6	1.25	950.8	5	73		BD 32t	1	TS 5.4m3	1	DT 32t	1				
3	Foundation Treatment Works																					
	Curtain grouting work	m	4,791	GP 7.8kw	-	8.5	563.6	1.30	735.1	2	368	13	BM 5.5kW	1	GM 2.2kW	2	G 60kVA	1				
4	Dam Emmbankment																					
	Impervious zone	m3	130,900	TR 30t	80.7	451.9	289.7	1.20	347.6	1	438	15										
	Others	LS	1								90		BD 21t	1								
5	Spillway																					
	Excavation / hauling, soil & gravel	m3	156,000	BD 44t	206.3	1,155.3	135.0	1.30	176.1	2	353	12										
	- ditto -, rock, ripping	m3	31,200	RD 32t	174.5	977.2	31.9	1.30	41.6	1	89		TS 5.4m3	2	DT 32t	8						
	- ditto -, rock, blasting	m3	7,800	CD 150kg	-	168.0	46.4	1.30	60.5	2	42		BD 32t	2	TS 5.4m3	1	DT 32t	4				
	Reinforced concrete	m3	29,390	AT 4.4m3	6.9	38.6	760.6	1.25	950.8	5	31		BD 32t	1	TS 5.4m3	1	DT 32t	1				
	Reinforced concrete	m3	1,099	AT 4.4m3	6.9	38.6	28.4	1.25	35.5	1	191		CM 0.5m3*1	1	TS 2.0m3	1	G 100kVA	1	CP 100m3/h	1	TC 25t	
6	Outlet Works																					
	Reinforced concrete	m3	1,099	AT 4.4m3	6.9	38.6	28.4	1.25	35.5	1	262	9										
	Gate and pipe installation	LS	1								36		CM 1.5m3*2	1	TS 2.0m3	1	G 100kVA	1	CP 100m3/h	1	DT 4t	
	Plain concrete (plugging)	m3	10,220	CM 0.5m3*1	16.8	94.1	108.6	1.25	135.8	1	90		TC 25t	1	DT 4t	1						
	Plain concrete (plugging)	m3	10,220	CM 0.5m3*1	16.8	94.1	108.6	1.25	135.8	1	136		AT 4.4m3	3	TS 2.0m3	1	G 100kVA	1	CP 100m3/h	1		

Tableau 9.2.3 Calendrier de Construction

Site	Work	Volume	Unit	1st year	2nd year	3rd year	4th year	
No.5 N'fifikh	Preparatory Work and Access Road etc.	1	LS	■				
	River Diversion	200	m	■				
	Dam	Excavation	172,900	m ³	■			
		Foudation Treatment	3,150	m		■		
		Embankment	678,400	m ³		■		
	Spillway	59,700	m ³		■			
	Intake and Outlet	1	LS			■		
	Others	1	LS				■	
	Irrigation Facilities	1	LS	■				
	No.9 Taskourt	Preparatory Work and Access Road etc.	1	LS	■			
River Diversion		52	m		■			
Dam		Excavation	242,100	m ³		■		
		Foudation Treatment	8,500	m			■	
		Embankment	415,000	m ³		■		
Spillway		-	m ³				■	
Intake and Outlet		1	LS				■	
Others		1	LS				■	
Irrigation Facilities		1	LS		■			
No.10 Timkit		Preparatory Work and Access Road etc.	1	LS	■			
	River Diversion	43	m	■				
	Dam	Excavation	165,900	m ³		■		
		Foudation Treatment	14,800	m			■	
		Embankment	227,600	m ³		■		
	Spillway	-	m ³				■	
	Intake and Outlet	1	LS				■	
	Sabo Dam	47,800	m ³			■		
	Others	1	LS				■	
	Irrigation Facilities	1	LS	■				
No.17 Azghar	Preparatory Work and Access Road etc.	1	LS	■				
	River Diversion	240	m	■				
	Dam	Excavation	258,000	m ³		■		
		Foudation Treatment	4,800	m			■	
		Embankment	746,700	m ³		■		
	Spillway	29,400	m ³		■			
	Intake and Outlet	1	LS			■		
	Others	1	LS				■	
	Irrigation Facilities	1	LS	■				

Tableau 9.3.1 Coût de Base de la Main d'Ouvre

No.	Description	Spec	Basic Cost (DH/day)
L1	Foreman	-	172.70
L2	Skilled Labor	-	79.90
L3	Common Labor	-	79.90
L4	Scaffolding Man	-	110.90
L5	Carpenter	-	110.90
L6	Reinforcement Worker	-	79.90
L7	Welder	-	117.60
L8	Plaster	-	110.90
L9	Mason	-	110.90
L10	Painter	-	98.20
L11	Electrician	-	117.60
L12	Mechanic	-	135.70
L13	Rock Driller	-	110.90
L14	Plumber	-	110.90
L15	Plant Operator	-	152.70
L16	Operator A	Heavy Equipment	152.70
L17	Operator B	Light Equipment	98.00
L18	Driver	-	98.00

Tableau 9.3.2 Coût de Base du Matériel (1/3)

No.	Description	Spec	Unit	Basic Cost (DH)
M1	Cement	-	ton	850
M2	Fine Aggregate	-	m ³	480
M3	Coarse Aggregate	5-15mm	m ³	320
M4	Coarse Aggregate	15-25mm	m ³	320
M5	Crusher Run	0-40mm	m ³	240
M6	Rubble	-	m ³	144
M7	Deformed Steel Bar	-	ton	10,200
M8	Gasoline	-	lit	9.09
M9	Diesel	-	lit	6.1
M10	Oil	-	lit	19.2
M11	Asphalt Mixture	-	ton	6,000
M12	Gunpowder	for blasting	kg	9.3
M13	Detonator	-	pcs	17
M14	Block	L,35cm	m ³	144
M15	Concrete Block	0.2*0.2*0.4m	pcs	5.82
M16	Brick	0.15*0.2*0.4m	pcs	5.16
M17	Plywood	15mm	m ²	204
M18	Timber	Plank	m ³	3,600
M19	Scaffolding Board	240*4,000mm	pcs	3,500
M20	Form Oil	20m2/lit	lit	36
M21	Nail	-	kg	11
M22	Binding Wire	-	kg	10
M23	Wire	D8mm	m	12
M24	Barbed Wire	#14, 50mm	m	68
M25	Gabion	-	m ³	500
M26	Channel Steel	100mm	ton	6,800
M27	Angle Steel	50*50*5mm	ton	7,000
M28	H Beam	200mm	ton	6,700
M29	Steel Water Tank	2,000lit	pcs	25,000
M30	Semicircular Pipe	D600<=800mm	m	750
M31	Semicircular Pipe	D300<=400mm	m	250
M32	Steel Pipe	D800, t;6mm	m	2,268
M33	Steel Pipe	D600, t;6mm	m	1,540

Tableau 9.3.2 Coût de Base du Matériel (2/3)

No.	Description	Spec	Unit	Basic Cost (DH)
M34	PC Pipe PC10	D400, 7m	m	85
M35	PC Pipe PC10	D600, 7m	m	170
M36	PC Pipe PC10	D800, 7m	m	250
M37	RC Pipe	D300<=400mm	m	150
M38	RC Pipe	D500<=600mm	m	425
M39	RC Pipe	D600<=800mm	m	550
M40	RC Pipe	D800<=1,200mm	m	750
M41	PVC Pipe	10Bar, D110mm	m	88.67
M42	PVC Pipe	10Bar, D160mm	m	151.67
M43	PVC Pipe	10Bar, D200mm	m	235
M44	PVC Pipe	10Bar, D250mm	m	438.33
M45	PVC Pipe	10Bar, D3150mm	m	698.33
M46	Asbestos Pipe	D100mm, 5m	pcs	720
M47	Asbestos Pipe	D150mm, 5m	pcs	1110
M48	Asbestos Pipe	D200mm, 5m	pcs	1765
M49	Asbestos Pipe	D250mm, 5m	pcs	2270
M50	Asbestos Pipe	D300mm, 5m	pcs	2895
M51	Sluice Valve	D100mm	pcs	173
M52	Sluice Valve	D200mm	pcs	334
M53	Sluice Valve	D250mm	pcs	495
M54	Sluice Valve	D300mm	pcs	743
M55	Butterfly Valve	D100mm	pcs	672
M56	Butterfly Valve	D200mm	pcs	1,815
M57	Butterfly Valve	D250mm	pcs	6,504
M58	Butterfly Valve	D300mm	pcs	7,740
M59	Survey Pole	4M stainless	pcs	16,000
M60	Helmet	-	pcs	51
M61	Boot	-	pcs	77
M62	Rope	9mm	kg	250
M63	Fire Extinguisher	Powder, p;6kg	pcs	780
M64	Light	300w10m code	pcs	750
M65	Gas Cutter	-	pcs	210
M66	Electric Drill	300w10m code	pcs	15,000

Tableau 9.3.2 Coût de Base du Matériel (3/3)

No.	Description	Spec	Unit	Basic Cost (DH)
M67	Electric Saw	-	pcs	600
M68	Welding Rod	240pcs	pcs	500
M69	Admixture	-	kg	45
M70	Cross Bit	D65mm	pcs	350
M71	Rod	D38mm, L=3m	pcs	1,240
M72	Shank Lod	D38mm	pcs	2,319
M73	Diamond Bit	D46mm, 12ct	pcs	1,330
M74	Diamond Leaming Shell	D46mm, 4ct	pcs	185
M75	Core Tube	D46single, 1.5m	pcs	2,700
M76	Core Lifter	D46mm	pcs	2,700
M77	Boring Lod	D40.5mm, L=3m	pcs	1,240
M78	Electric Power Charge	40A	kwh	4,500
M79	Water Stop	PVC, B=300mm	m	300
M80	Net Fence	H=1.5m	m	1,200
M81	RC Pipe	D<=100mm	m	32
M82	RC Pipe	D100<=200mm	m	42.5
M83	RC Pipe	D200<=300mm	m	100
M84	RC Pipe	D400<=500mm	m	225
M85	RC Pipe	D1,200<=1,300mm	m	900
M86	Semicircular Pipe	D<=100mm	m	32.5
M87	Semicircular Pipe	D100<=200mm	m	42.5
M88	Semicircular Pipe	D200<=300mm	m	150
M89	Semicircular Pipe	D400<=500mm	m	350
M90	Semicircular Pipe	D500<=600mm	m	500
M91	Semicircular Pipe	D800<=1,200mm	m	900
M92	Timber	Square	m ³	130
M93	Timber	Log L=2m	kg	1
M94	Timber	Log L=3m	kg	1.1
M95	Timber	Log L=4m	kg	1.2
M96	Timber	Log L>4m	kg	1.5
M97	Sleeve	38mm	pcs	998
M98	Metal Crown	D46mm	pcs	400
M99	Injection Pipe (inner)	D46mm, 1.5m	pcs	322
M100	Injection Pipe (outer)	D46mm, 1.5m	pcs	322

Tableau 9.3.3 Coût de Base du l' Equipement

No.	Description	Spec	Basic Cost (DH/day)	
E1	Bulldozer	44t	6,730	
E2	Bulldozer	32t	5,050	
E3	Bulldozer	21t	4,500	
E4	Bulldozer	11t	2,050	
E5	Swamp Bulldozer	16t	2,640	
E6	Ripperdozer	44t	4,490	
E7	Ripperdozer	32t	3,670	
E8	Tractor Shovel	5.4m ³	6,080	
E9	Tractor Shovel	3.2m ³	2,400	
E10	Tractor Shovel	2.0m ³	1,570	
E11	Backhoe	1.2m ³	5,820	
E12	Backhoe	0.6m ³	2,590	
E13	Backhoe w/slope bucket	0.6m ³	2,590	
E14	Backhoe	0.4m ³	1,660	
E15	Breaker (attachment)	0.6m ³	1,218	
E16	Dump Truck	32t	5,140	
E17	Dump Truck	10t	1,320	
E18	Dump Truck	7t	940	
E19	Dump Truck	4t	520	
E20	Dump Truck (Tunnel)	14t	3,320	
E21	Tamping Roller	30t	4,910	
E22	Road Roller	10-12t	880	
E23	Vibrating Roller	15-18t	2,700	
E24	Vibrating Roller	11t	2,500	
E25	Vibrating Roller	600kg	170	
E26	Tire roller	8-20t	1,020	
E27	Vibratory Compactor	90kg	36	
E28	Tamper	60kg	45	
E29	Motor Grader	3.1m, 115ps	2,560	
E30	Pick Hammer	-	9	
E31	Jack Hammer	20kg	50	
E32	Leg Drill	40kg	70	
E33	Crawler Drill	150kg(Oil)	5,930	
E34	Boring Machine (Rotary)	5.5kw	304	
E35	Air Compressor	5m ³ /min	269	
E36	Air Compressor	10m ³ /min	547	
E37	Ventilation Fun	400m ³ /min	258	
E38	Grouting Pump	7.8kw	220	
E39	Grouting Pump	4.4kw	145	
E40	Grouting Mixer	5.5kw	187	
E41	Grouting Mixer	2.2kw	114	
E42	Concrete Mixer	0.5m ²	2,050	
E43	Concrete Mixing Plant	1.5m ³ *2	8,290	
E44	Concrete Mixing Plant	3.0m ³ *2	11,610	
E45	Crushing Plant	576m ³ /d,100t/h	9,170	
E46	Generator	60kVA	319	
E47	Generator	100kVA	421	
E48	Generator	150kVA	622	
E49	Agitator Truck	4.4-4.5m ³	1,160	
E50	Concrete Pumping Car	90-110m ³ /h	4,740	
E51	Truck Crane	25t	4,600	
E52	Finisher (Asphalt)	2.4-4.5m	4,020	
E53	Welding Machine	300A	17	
E54	Watering Truck	5.5-6.5t	850	
E55	Grout Central Plant	150l/min	1,358	
E56	Grout Injection Gauge	120l/min	1,066	
E57	Grout Data Recorder	-	505	
E58	Screen	1500*3500	870	
E59	Concrete Mixer	0.5m ³	1,025	
E60	Generator	10kVA	128	

Remarks
All Equipement in this table
can be procured in Morocco

Tableau 9.3.4 Tableau d'Estimation du Coût

		Cost Amount (1,000DH)												Total		
		No.5 N'Fifikh			No.9 Taskourt			No.10 Timkit			No.17 Azghar			Local	Foreign	Total
		Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
A	Dam	H=47.5m, Vol.=678,400m ³			H=73.5m, Vol.=415,000m ³			H=64.5m, Vol.=227,600m ³			H=42.5m, Vol.=769,800m ³					
	1 River Diversion Works	6,325	11,745	18,070	1,823	3,384	5,207	1,161	2,156	3,317	6,776	12,588	19,364	16,085	29,873	45,958
	2 Foundation Excavation	2,676	4,971	7,647	6,025	11,196	17,221	3,673	6,826	10,499	3,356	6,234	9,590	15,730	29,227	44,957
	3 Foundation Treatment Works	1,245	2,313	3,558	3,392	6,300	9,692	6,183	11,484	17,667	1,897	3,522	5,419	12,717	23,619	36,336
	4 Dam Embankment	4,041	7,515	11,556	61,548	114,308	175,856	29,996	55,708	85,704	5,606	10,425	16,031	101,191	187,956	289,147
	5 Spillway	24,670	45,820	70,490	716	1,331	2,047	347	643	990	12,352	22,941	35,293	38,085	70,735	108,820
	6 Outlet Works	1,283	2,383	3,666	842	1,565	2,407	208	386	594	422	783	1,205	2,755	5,117	7,872
	7 Gate and Pipe	2,998	5,566	8,564	4,340	8,059	12,398	1,203	2,235	3,438	4,347	8,072	12,419	12,888	23,932	36,820
	(8 Sabo Dam, No.10 Timkit only)	-	-	-	-	-	-	6,601	12,261	18,862	-	-	-	6,601	12,261	18,862
	Sub-total	43,238	80,313	123,551	78,686	146,143	224,828	49,372	91,699	141,071	34,756	64,565	99,321	206,052	382,720	588,772
	8 Overhead and Profit of Contractor	6,860	12,742	19,602	17,692	32,860	50,552	7,457	13,850	21,307	4,612	8,566	13,178	36,621	68,018	104,639
	Sub-total (Direct Construction Cost)	50,098	93,055	143,153	96,378	179,003	275,380	56,829	105,549	162,378	39,368	73,131	112,499	242,673	450,738	693,411
	9 Physical Contingency (10%)	5,010	9,306	14,316	9,638	17,900	27,538	5,683	10,555	16,238	3,937	7,313	11,250	24,268	45,074	69,342
	Sub-total (1-9)	55,108	102,361	157,469	106,016	196,903	302,918	62,512	116,104	178,616	43,305	80,444	123,749	266,941	495,812	762,753
	10 Price Contingency (3%/year)	12,668	23,530	36,198	24,370	45,263	69,633	14,370	26,689	41,059	9,955	18,492	28,447	61,363	113,974	175,337
	Sub-total (1-10)	67,776	125,891	193,667	130,386	242,166	372,551	76,882	142,793	219,675	53,260	98,936	152,196	328,304	609,786	938,090
	11 Value Added Tax (14%)	9,489	17,625	27,114	18,254	33,903	52,157	10,764	19,991	30,755	7,456	13,851	21,307	45,963	85,370	131,333
	Grand Total	77,200	143,500	220,700	148,600	276,000	424,600	87,600	162,700	250,300	60,700	112,700	173,400	374,100	694,900	1,069,000
	Unit Cost (DH/m ³)			325			1,023			1,100			225			
B	Irrigation Facilities	Area=1,000ha			Area=4,500ha			Area=3,060ha			Area=2,000ha					
	1 Mian Canal	6,410	6,410	12,820	19,276	19,276	38,552	7,946	7,946	15,892	6,111	6,111	12,222	39,743	39,743	79,486
	2 Structures	10,647	10,647	21,294	42,268	42,268	84,536	44,535	44,535	89,070	28,159	28,159	56,318	125,609	125,609	251,218
	Sub-total	17,057	17,057	34,114	61,544	61,544	123,088	52,481	52,481	104,962	34,270	34,270	68,540	165,352	165,352	330,704
	3 Overhead and Profit of Contractor	1,194	1,194	2,388	4,308	4,308	8,616	3,674	3,674	7,348	2,399	2,399	4,798	11,575	11,575	23,150
	Sub-total (Direct Construction Cost)	18,251	18,251	36,502	65,852	65,852	131,704	56,155	56,155	112,310	36,669	36,669	73,338	176,927	176,927	353,854
	4 Physical Contingency (10%)	1,825	1,825	3,650	6,585	6,585	13,170	5,616	5,616	11,232	3,667	3,667	7,334	17,693	17,693	35,386
	Sub-total (1-9)	20,076	20,076	40,152	72,437	72,437	144,874	61,771	61,771	123,542	40,336	40,336	80,672	183,045	183,045	366,090
	5 Price Contingency (3%/year)	4,617	4,617	9,234	16,661	16,661	33,322	14,207	14,207	28,414	9,277	9,277	18,554	44,762	44,762	89,524
	Sub-total (1-10)	24,693	24,693	49,386	89,098	89,098	178,196	75,978	75,978	151,956	49,613	49,613	99,226	227,807	227,807	455,614
	6 Value Added Tax (14%)	3,457	3,457	6,914	12,474	12,474	24,948	10,637	10,637	21,274	6,946	6,946	13,892	33,514	33,514	67,028
	Grand Total	28,150	28,150	56,300	101,570	101,570	203,100	86,610	86,610	173,200	56,550	56,550	113,100	272,880	272,880	545,760
	Unit Cost (DH/ha)			56,300			45,100			56,600			56,600			
C	Total of Dam and Irrigation	277,000			627,700			423,500			286,500			1,614,760		